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AMERICAN

DYESTUFF REPORTER

Volume 49 April 18, 1960 No. 8

ORIGINS OF CHLORINE BLEACHING IN AMERICA

SIDNEY M EDELSTEIN
Dexter Chemical Corp
New York, NY

AMERICAN paper manufacturers have been confronted often with the problem of obtaining an adequate and suitable source of fibrous raw materials. A new chemical process has usually been the answer. Most of us think of the introduction of the "Sulphite Process" as the first example. Actually, it was the adoption of chlorine for bleaching rags which marked the real beginning of the chemical approach to "paper" problems.

While European papermakers had taken up the use of this new chemical bleach almost as soon as its potent action became known, it has generally been claimed that the Americans were at least forty years late in making use of this discovery.

In discussing the raw material problems of early American papermaking, William Haynes, the historian of the American Chemical Industry, had this to say (*1*):—

"Real relief from the raw materials impassé came about 1830 when chlorine bleaching was introduced. This innovation proved to be analogous in its effects to the solution by this same chemical reagent of the gray goods' problem in the textile industry. Chlorine bleaching enabled papermakers to rework paper stock and also to use soiled and colored rags.

"Unfortunately the record of where and by whom chemical bleaching was first introduced into American paper mills has been lost. To borrow the already well-known bleaching technique from the textile industry was an ingenious but not a revolutionary adaptation. It may well have been made independently in a number of different plants. Chemical processes were then heavily veiled in mystery and in accordance with ancient craft habits still in vogue, the early use of chlorine was no doubt cherished as a valuable trade secret. We know definitely that chemical bleaching was employed here (The United States) about 1830 and that it soon became almost universal practice. By that time it became an essential element in pulping both wood and straw and its mechanical application had been much improved."

EDITOR'S NOTE: It is our belief that this article, which will appear also in *Tappi* this month, will be of interest to our readers who may be unaware of the fact that, as early as 1798, the use of chlorine for bleaching papermaker's rags and paper was the subject of an American patent and that chlorine was being manufactured and used for bleaching rags at the Gilpin Paper Mills in Delaware by the summer of 1804. The spot is now occupied by buildings of Joseph Bancroft and Sons Co.

A short distance up the Brandywine lies the Hagley Museum, devoted to the early industries on the Brandywine, which gives a prominent place to the work of the Gilpin brothers. Those planning to attend the AATCC Convention in Philadelphia this year may wish to make the short trip to this historical area.

Figure 1
The Gilpen manuscript records on bleaching.

Fortunately, this writer recently discovered manuscript records of Delaware's first paper mill, which completely disprove the claims of American slowness in adopting chlorine to paper manufacture. These records prove that, as early as 1798, the use of chlorine for bleaching papermaker's rags and paper was the subject of an American patent and that chlorine was being manufactured and being used for bleaching rags at the Gilpin Paper Mills in Delaware by the summer of 1804. Furthermore, these early dates would indicate that, in this country, the paper industry was the first to adopt the use of chlorine and not the textile industry as has been suggested by Haynes and others.

The discovered records consist of 179 sheets of old paper of different manufacture, covered with writing in different hands, and bound together. Various parts of the writing, dates inscribed, and other internal evidence, indicate that these are records of the old Gilpin Mills, first erected on the Brandywine in Delaware in 1787. Further studies have revealed that a portion of the writings are in the hand of Joshua Gilpin, one of the owners and founders of the Brandywine Mill, and are actually technical letters on the use of chlorine for bleaching as practiced in England and Scotland at the end of the 18th century. They were written by Joshua to his brother, Thomas, in Delaware, during the former's stay in England during the years 1795 to 1801. The records also contain detailed plans of the bleaching room at the Brandywine Paper Mill, details of the equipment in use for making chlorine in 1804, and records of operation. Of equal importance is the inclusion in a license agreement of the Gilpin Mills of the only known transcript of the patent of Cyrus Austin on the use of

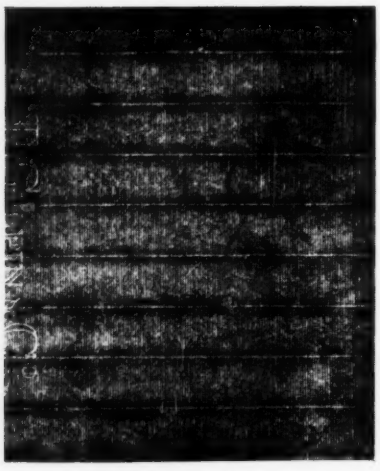


Figure 2
Blank page from Gilpen records showing watermark "T Gilpin and Co".

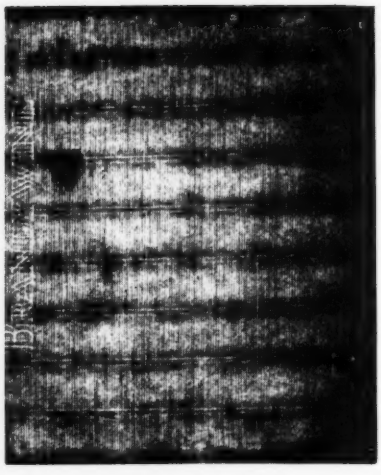


Figure 3
Blank page from Gilpen records showing watermark "Brandywine".

chlorine for bleaching rags and paper granted by the United States in 1798.[1]

Joshua and Thomas Gilpin founded the first paper mill in the state of Delaware in 1787—the year of the American Constitution. The Gilpin brothers were the sons of a famous father, Thomas Gilpin, a friend of Franklin and an ardent Quaker. Thomas Gilpin Sr was not only successful in business but also inherited extensive properties in Maryland and Delaware. At the time of Joshua Sr's death in 1778, the two sons were children. Joshua was twelve years old, and Thomas less than two.

The boys were given the best education that Philadelphia could afford. Joshua studied the law but never actually entered the profession. Thomas, in particular, showed a remarkable interest and ability for mathematics and science. The exact story, however, as to how and why the two brothers, one aged twenty-two and the other aged eleven, started a paper mill may never be known. We do know that they were assisted by their maternal uncle, Miers Fisher, in the early days of the venture. Perhaps the uncle actually ran the plant during the initial stages while the elder Joshua supervised the many family properties and the very young Thomas devoted himself to studying the technical problems of a papermill (*2,3*).

According to Dard Hunter, the earliest printed description of the Gilpin Paper Mills appeared in the account of Jacques Pierre Brissot de Warville's travels in the United States during the year 1788. The statesman wrote of his trip to Wilmington and his visit to the Gilpin Mill in 1788 in the following words (*4*):—

". . . . . I set out from Philadelphia for Wilmington, distance twenty-eight miles, and road tolerably good. The town of Chester, fifteen miles from Philadelphia, is a place where strangers like to rest. It stands on a creek, which falls into the Delaware. It enjoys some commerce, and the taverns here are good. Wilmington is much more considerable; it stands likewise on a creek near the Delaware; the basis of its commerce is the exportation of flour. One mile above Wilmington, you pass the town of Brandywine; the name of which will call to your mind a famous battle gained by the English over the Americans, eight miles from this town, on a river of the same name. This town is famous for its fine mills; the most considerable of which is a papermill belonging to Mr Gilpin and Myers (Miers) Fisher, that worthy orator and man of science . . . . Their process in making paper, especially in grinding the rags, is much more simple than ours. I have seen specimens of their paper, both for writing and printing, equal to the finest made in France."

By the year 1795, Joshua, the elder brother, was 30 years old. The family business was successful and with his mother in excellent health and with his brother actively operating the papermill on the Brandywine, he decided to visit Europe to satisfy a desire that he had for many years.

Joshua sailed for England in 1795, and did not return to America until 1801. In England he visited all the great manufacturers and studied mining operations and metallurgical enterprises. He visited the great works of Watt and Bolton at Soho (*5*). Of particular interest to us, however, is the fact that he visited most of the papermills of England and Ireland and most of the bleaching establishments where the new chemical methods of bleaching with chlorine had only shortly been introduced from France. Not only did Joshua make notes of his visits to these papermills in his journal, but he also wrote detailed letters and technical surveys about chlorine bleaching to his brother, Thomas.[2] These letters and surveys are a part of our manuscript records and give a first-hand account of the very earliest operations.

Until the discovery of the bleaching action of chlorine, rags were bleached or decolorized by boiling in alkali and exposing them to the sun over a long period of time. Many colors in the rags could not even be removed by this method. The advent of chlorine bleaching not only furnished a method for speeding up the process of obtaining satisfactory material for use in making paper, but many types of rags could now be decolorized which heretofore had been useless in the manufacture of paper. Joshua's visit to England took place at just about the time when the process was widely being put into practical use.[3] His own words written between 1795 and 1801 give us the thrilling story of this beginning. Joshua wrote to his brother:

"The new mode of bleaching consists in adopting in lieu of the former processes the application of

[1]Joshua's writings are on 48 leaves and on one side of each leaf only. The first 36 leaves show no chain lines and bear watermark: "I Taylor 1794." The following 16 leaves show chain lines and bear watermark: "I I Arking, 1796." The plans of the bleaching room and the patent agreement are on paper made at the Gilpin Mills bearing watermarks: "T Gilpin Co" and "Brandywine."

[2]In the Division of Public Records, Commonwealth of Pennsylvania, Harrisburg, Pa, are deposited the journals kept by Joshua Gilpin during his visit to Europe. The records are dated from 1795 to 1801. These journals record the visits to various papermills in England and Scotland which are discussed in detail in our manuscript records.

[3]Scheele first prepared chlorine in 1774 by the action of manganese dioxide on hydrochloric acid. Scheele thought that the gas was the acid deprived of "phlogiston," and called it "dephlogisticated muriatic acid." It was believed to be a compound until 1810 when Davy proved its elementary nature. Scheele early noted chlorine's declorizing action, but Berthollet first proposed its use as a commercial bleaching agent in 1785. According to the Clows (*6*), the process was introduced into Scotland by two routes. The first was through James Watt, who learned the process directly from Berthollet in 1786 or 1787 and put it to work at his father-in-law's (MacGregor) bleachery by 1788. The second route was through Patrick Copland of Aberdeen, who learned the process from Professor DeSaussure of Geneva in 1787. Copland communicated the process to Messrs Gordon Barron and Company of Aberdeen who had the process in operation commercially by July, 1787.

the oxygenated muriatic acid either in the acid or simply in the state of gas or vapeur[4].

"We are indebted to Scheele, the Swedish chymist, for the discovery both of the oxygenated muriatic acid itself and of its properties in changing all substances into a perfectly white color. Scheele however went little further than establishing the fact and shewing its application to the bleaching manufacture—his improvements were confined I believe wholey to the operation of the gas itself.

"Berthollet, the French Chymist entered most actively into experiments on the subject and we are indebted to him principally for the introduction of the art into its present extensive operation—his experiments were first published in papers addressed to the Academy at Paris in the Annalls de Chimie —they were afterwards comprised in a small volume which has been translated by Mr Kerr.—Berthollet finding the inconveniences of applying the acid in the state of gas or vapeur, substituted the condensing and mixing it with water as to form a highly acidulated liquor.

"Since the process has been known in England it has been adopted in various ways and received numerous improvements both here and in France. Several patents have been taken out most of which I shall explain; in general however it may be remarked that all are but variations or different applications of the same principle. And that as yet it appears far from having arrived at the perfection there is every reason to believe it will attain.

"One of the latest short works on the subject is that entitled, "The Art of Bleaching by Pajot des Charmes" translated by W Nicholson—this is an elementary work taking up the processes of M Berthollet and explaining the best methods of surmounting the difficulties he had experienced and of carrying this principle into compleat effect. It seems in fact to be a summary of what has been done in France on the subject; it is to be regretted one has not some work comprising the processes of the English Manufactories especially those of Manchester Glasgow and where as well as in Ireland the new

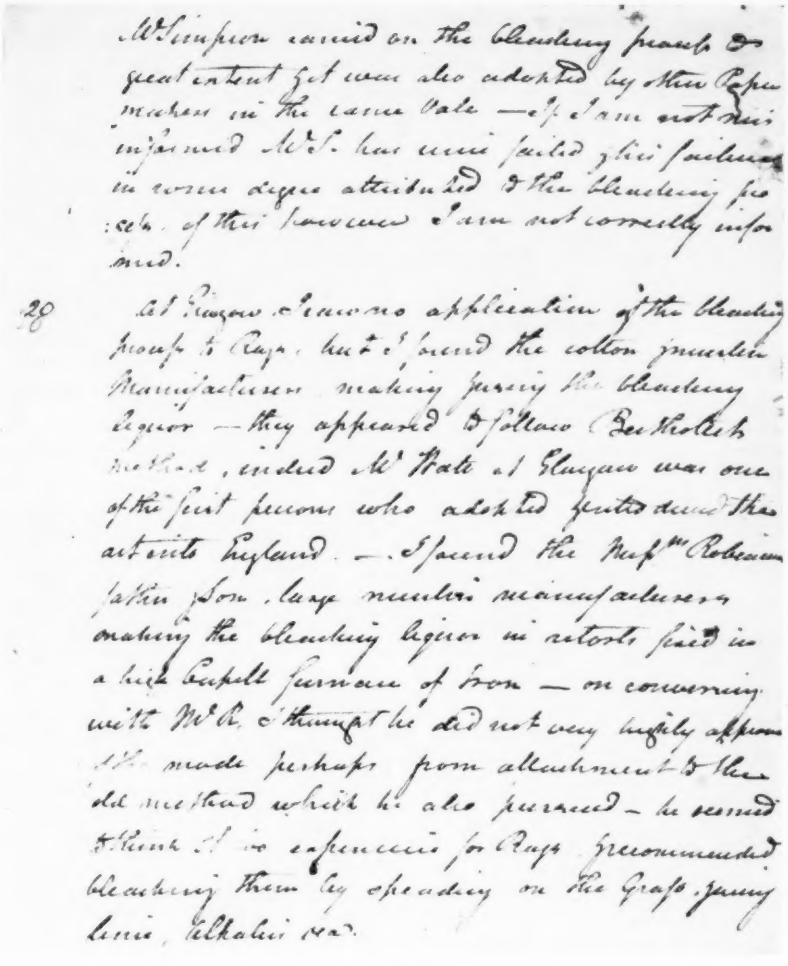


Figure 4
Leaf from Joshua Gilpen's report on chlorine bleaching.

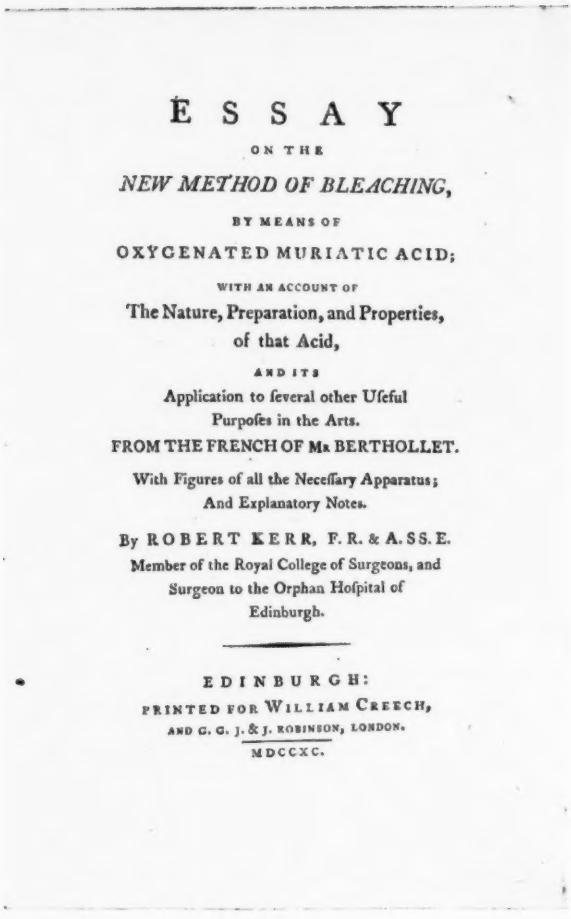
bleaching process has been adopted to considerable extent. In effect: the English artists however in general content themselves with establishing processes suited to their own operations and tho the principles and practice of this art are now neither secret nor new tis alone by actual inspection, that we are left to collect everything beyond merely the publication of the patents or some works more scientific than of practical men—this is the more to be regretted as in the infancy of a process which promises to be of such general use, the communication of facts attending its improvements would tend to perfect it more speedily than any other method.

"The leading application of the bleaching process was obviously first to whitening cotton, linen and other cloths—that of rags however for paper struck almost the first discoverers: the only difference between the sepertive articles is that cloths of every kind will bear the expence of a far superior process; while the application to rags must be very cheap in order to be useful—in what I now mention I shall very much confine myself to the process particularly applicable to the paper manufacture.

"All the processes mentioned by the French chemists and indeed most of those known in England have combined the application of the muriatic acid[5]—with the use of lees or alkalies generally resembling (?) in many respects from the processes formerly in use—Berthollet's method in general consisted in many alternate immersions in lees and in the bleaching liquor; it must be obvious however that the labor which these repeated operations demand cannot be introduced into paper manufacture at least in the bleaching of the rags, as no saving will bear it: it can alone be useful by a cheap application of the

[4]By 1795 the "phlogiston" theory had been discarded by most chemists. Instead of things giving up "phlogiston," in combustion reactions, it was now felt that oxygen was taken up instead. The dephlogisticated muriatic acid had now become oxygenated muriatic acid. It was not to become chlorine until 1810.

[5]Gilpin must have meant oxygenated muriatic acid.



ESSAY

ON THE

NEW METHOD OF BLEACHING,

BY MEANS OF

OXYGENATED MURIATIC ACID;

WITH AN ACCOUNT OF

The Nature, Preparation, and Properties,
of that Acid,

AND ITS

Application to ſeveral other Uſeful
Purpoſes in the Arts.

FROM THE FRENCH OF Mr BERTHOLLET.

With Figures of all the Neceſſary Apparatus;
And Explanatory Notes.

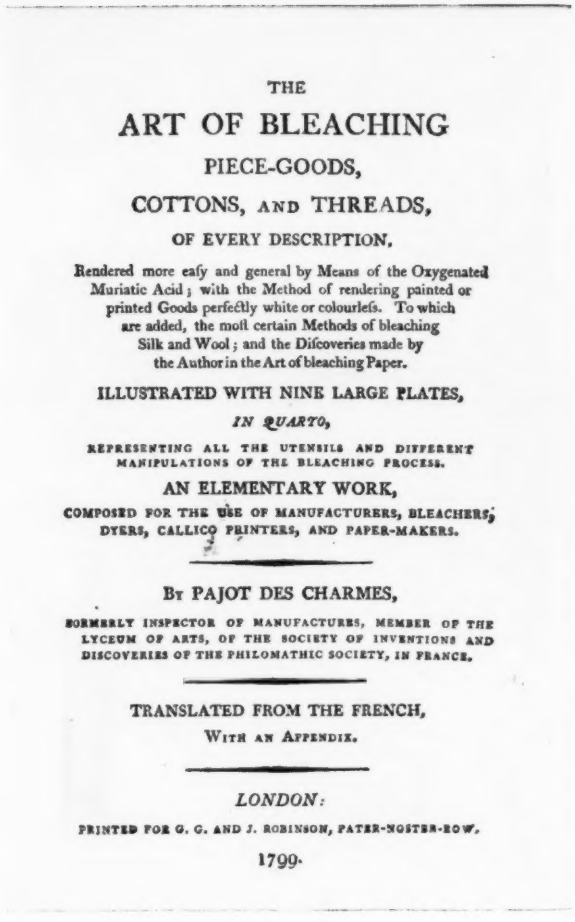
By ROBERT KERR, F. R. & A. SS. E.
Member of the Royal College of Surgeons, and
Surgeon to the Orphan Hoſpital of
Edinburgh.

EDINBURGH:

PRINTED FOR WILLIAM CREECH,
AND G. G. J. & J. ROBINSON, LONDON.

MDCCXC.

Figure 5
Title page of Kerr's translation of Berthollet's work on chlorine bleaching. Edinburgh, 1790.



THE

ART OF BLEACHING

PIECE-GOODS,

COTTONS, AND THREADS,

OF EVERY DESCRIPTION.

Rendered more eaſy and general by Means of the Oxygenated Muriatic Acid; with the Method of rendering painted or printed Goods perfectly white or colourleſs. To which are added, the moſt certain Methods of bleaching Silk and Wool; and the Diſcoveries made by the Author in the Art of bleaching Paper.

ILLUSTRATED WITH NINE LARGE PLATES,

IN QUARTO,

REPRESENTING ALL THE UTENSILS AND DIFFERENT MANIPULATIONS OF THE BLEACHING PROCESS.

AN ELEMENTARY WORK,

COMPOSED FOR THE USE OF MANUFACTURERS, BLEACHERS, DYERS, CALLICO PRINTERS, AND PAPER-MAKERS.

By PAJOT DES CHARMES,

FORMERLY INSPECTOR OF MANUFACTURES, MEMBER OF THE LYCEUM OF ARTS, OF THE SOCIETY OF INVENTIONS AND DISCOVERIES OF THE PHILOMATHIC SOCIETY, IN FRANCE.

TRANSLATED FROM THE FRENCH,

WITH AN APPENDIX.

LONDON:

PRINTED FOR G. G. AND J. ROBINSON, PATER-NOSTER-ROW.

1799.

Figure 6
Title page of English edition of Pajot des Charmes' work on bleaching. London, 1799.

principle with little labor and cost of the materials used.

"The general principle on which the whole process rests seems to be no more than giving a quick and superior affect to the action of that part of the common air of the atmosphere which is called oxygen—neither of the two acids or salts employed with the sulfuric, or the muriatic possess this quality either singly or combined together, or with any substances which do not afford a large portion of oxygen or vital air nor has the manganese any other effect than being a cheap substance which yields a very large quantity of such air.

"The process indeed may be termed little more than quickening that operation which nature is constantly carrying on in the open air where goods of every kind, in particular such substances as are now described are deprived of their color by simple exposure and more or less time in India, many parts of France and other countries. No method is used but simple exposure to the sun, dews, grasses: we know the affect of long time on almost every substance particularly how the best ink becomes discharge from paper, especially if not carefully kept from exposure to the atmosphere.

"There seems to be a strong disposition in Sulphur to combine with and quicken the operation of the atmosphere. Most substances particularly woolen goods are made white by being exposed to its fumes in a close room—an acidulated liquor formed of it is used to bleach linen. If paper which has been written on for almost any length of time be immersed in a solution of vitriol in water, the ink will become nearly discharged.

"The oxygenated muriatic acid is produced by simply mixing common salt, called chemically muriate of soda. Oil of vitriol called sulphuric acid and manganese—(an earth consisting chiefly of a decomposed iron ore,[6] and found often and in large quantities) together in proper proportions in vessels calculated simply to distill them—the union of these several substances especially if assisted by a moderate heat, begins immediately to produce a strong vapeur or gas called the oxygenated muriatic acid gas, and if this be conducted into vessels filled with water, it combines with water, to produce the oxygenated muriatic acid.

"There are several objects necessary to be known and attended to in the outset of these processes. First, that it is exceedingly prejudicial to the health of those who use it without proper precautions which however are affectual. Secondly, that in carrying it on both the utensils and place in which it

[6]By manganese, Gilpin meant pyrolusite or manganese dioxide. Gilpin should have known this mineral was not "decomposed iron ore," for by 1774 Gahn had isolated the metal, manganese, and shown that pyrolusite was a "calx" (oxide) of this different metal.

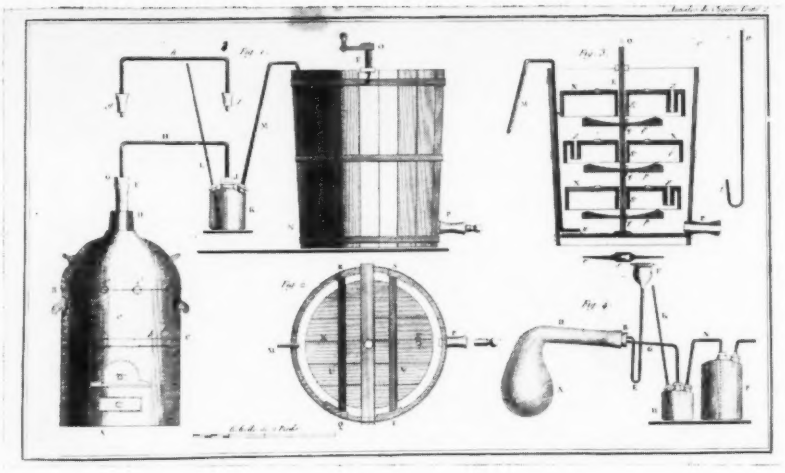


Figure 7
Plate from Berthollet's French work on chlorine bleaching shows apparatus for making chlorine solutions and bleaching apparatus. Paris, 1786.

is done must be formed without metals particularly iron to which the gas and liquor have a strong attraction and will soon destroy—lead however resists its action and may be usefully employed in all its processes—the precautions with respect to health will be mentioned in their proper place—and with respect to the action of the acid on metals it is only to shew the propriety of fixing on a place such as an outhouse or building in some degree detached from another in order to carry on the process, it need however not be at any material distance. (at Brandywine I should think at the end of the screening house or at the end of the waterwheel—)

"I have not by me Scheele's experiments. They may however be attended to advantage as his experiments allude to the simple application of the gas itself which as it is infinitely less laborious than forming it into a liquor and appears far more proper for the paper business than the more tedious and expensive one of the liquor.

"Scheele met with many difficulties, the chief of which were to submit the cloths and substances to an uniform action of the gas which being necessarily confined in close vessels, the cloths were but partially acted upon; this difficulty may be not only removed with respect to rags but is not at least of the same moment as in piece goods whose preservation and being perfectly whitened throughout were objects of the first consideration.

"From the difficulties occurring to Scheele, Berthollet's attention was principally devoted to conducting the process by the liquor—he distilled the above articles in a glass retort laid in a proper furnace and conducting the gas into a tub filled with water, impregnated the water and thus formed a liquor in which he afterwards immersed the substance to be bleached—these immersions were often repeated and made also alternately in Lees, or solutions of alkalies—they were altogether tedious and expensive and not successful to a degree proper to be adopted in bleaching of rags.—His work however is to be read as offering at once all the principles giving compleat personal knowledge of the whole process.

"M Des Charmes, taking up the difficulties which Berthollet met with first enumerates the various methods he has taken to obviate them, and then proceeds to an ample description of the whole improved process such as it has been carried into affect in France.—His process is extended not only to bleaching rags and paper itself, but to a variety of other substances and also to an application of the oxygenated muriatic acid to dyeing and to a variety of other useful objects—His book in fact forms a compendium of what has been done on the subject in France.—Not only from his immediate process a good mode of bleaching paper may be formed, but through a variety of hints scattered thru his work which may form the basis of carrying the art far beyond its present perfection.

"The only publication which I have yet met with in England on the subject are translations from the French, and the specification of patents mentioned in the Repository—there may however exist elementary works with which I am not acquainted but I suspect as yet nothing has been published which is not comprised in the works I have mentioned, and that I apprehend the bleaching of rags in a cheap simple manner yet remains an important object for future experiment.

"The several improvements or methods for which patents have been obtained, all of them which have come to my knowledge are no more than variations of the methods laid down by the French chemists and most of them so little vary from them as scarcely to possess any originality—I shall however describe them.

"After thus describing what has been published on the subject I shall mention what I have seen carried into effect in Europe.

"The first opportunity I had of observing the bleaching process was at the mills of W Simpson near Polton Bank in the Vale of Poplin near Edenburg.[7] This gentleman in a handsome manner communicated to me all his process. I found him applying the gas immediately to the rags. His furnace was of simple brick in one of the outer rooms of his mill; I believe he ran the rags thro the washing engine before he submitted them to the gas. He also boiled them in lees and this he proposed as highly useful not only in the bleaching but to destroy the hard remains of flax in the coarse linens which were the chief objects of his attempts—I think his retorts were of lead, and the gas condensed into troughs of deal (pine) of about 11 feet long 4 wide and 3 deep in which the rags were inclosed.—I do not think he had adopted any mode for preventing the effects of the gas on the workmen, but opening the the doors and letting the gas go off when the boxes were opened before the rags were taken out. I may not however be correct in remembering this circumstance. W Simpson carried on the bleaching process to a great extent and it was also adopted by other papermakers in the same vale—If I am not misinformed, W S has since failed and his failure in some degree attributed to the bleaching process, of this however I am not so surely informed.

"At Glasgow I saw no application of the bleaching process to rags,

[7] Joshua's journals in the Division of Public Records at Harrisburg contain details of visit to Simpson's mill with date, October 14, 1795.

but I found the cotton and muslin manufacturers making and using the bleaching liquor—they appeared to follow Berthollet's method, indeed Mr Wate (Watt?) at Glasgow was one of the first persons who adopted and introduced the art into England. I found the Messrs Robinson, Father and son, large muslin manufacturers making the bleaching liquor in retorts laid in a high cupell furnace of iron—On conversing with Mr R, I thought he did not very highly approve of the mode perhaps from attachment to the old method which he also pursued—he seemed to think it too expensive for rags, and recommended bleaching them by spreading on the grass and using lime, alkalies, leas.

"At S..... in Yorkshire, I saw a mill of (Simpson?) Brothers, the younger of whom had been brought up in Kent and had founded the mill here upon the newest and best construction, it had been built but a year or two when I saw it in Nov 1795 and the bleaching process had not then been introduced into it. I saw it again in Novem 1799, when they had introduced it in the best and simplest manner I have seen in England but as I mean to describe this method fully I shall not enlarge upon it here.

"In the spring of 1796 I visited the Kent mills and found the bleaching process had been taken up on a very extensive scale by many of them especially the Taylors[9]—I particularly visited Mr Smith's mill which had been built especially to carry on this process: I found him using the liquor which he made in a room adjoining the Engine—His furnace was a simple square brick one about 6 feet long 4 high and 2 wide. On the top a rim of iron enclosed the sand in which the retorts stood—The retorts were of stoneware made at Lambeth of the size of about 1 gallon ——The tubes were of cane or reed and luted I think with clay: there were I think 8 of these fixed in the sand and all conducted into a (lead?) receiver. The liquor was run into a cistern below the engine house and pumped up into the troughs in which it was applied to the rags—The rags are first washed in the engine and then let into the troughs and the liquor put upon them.

"I did not see the process at Mr Taylors so well as to describe it. In his mill however and indeed in all the other Kent mills which I saw, the liquor was acid and I derived much information which will appear in the course of my observations.

"After thus mentioning the history of this process and the observations I have made, I shall now proceed to a description of it in all its parts.

"First as to materials—The article of salt is too common and too well known to need much being said about it.—The strong dark salt is most recommended, it must be prepared by drying it very well pounding and sifting it fine as an intimate mixture of it with the manganese is of much consequence.

"Secondly. The manganese is a black metallic earth composed chiefly of iron and oxygen when broken if of the best sort it sparkles in fine brilliant needles[9]. Its general resemblance is very similar to lumps of fine pure smiths cinder or a black calx of iron—It may not be difficult to find it in America, until it is however it may be imported from London, Dublin, Bristol; indeed it is now a considerable article of commerce though not long since a neglected earth. The coast of Ireland abounds with it. The London price is (?) if not pure it will only require a greater quantity—It is acid in its original state as I know of no change it undergoes other than beating and sifting it very fine—that sort however should be chosen which is clean of all other stones as far as possible.

"It is to be observed that as the manganese is used solely to supply the oxygen any substance containing oxygen uncombined with others injurious to the process may be used. Nitre itself can yield an immense quantity of the oxygen, but where manganese is to be had nothing is more cheap.

"It would be worthwhile in carrying on the (?) process to have a small water works connected with the mill to grind the salt and manganese and to mix them.

"Thirdly, the sulphuric acid or oil of vitriol as the carrage of this article is not only expensive but subject to continual hazard, it would be a highly beneficial manufacture of itself in America[10]—Until it is made there however it must be imported and may be ordered from London, Liverpool, Bristol or Dublin. It costs about 6½ sh per lb. It would be an object to make it and I think might well be combined with the bleaching process as it requires a room of lead, the floor of which is covered about 1 or 1½ inch with water and sulphur mixed with saltpeter is placed in the room in a leaden pan and set on fire then it is left to burn and the vapeurs of the sulphur are attracted by and impregnates the water—.

"The reasons for thus making the sulphuric acid are that I think the same room might advantageously be used for exposing the rags to the gas,—It strikes me also that perhaps the very process itself of making oil vitriol might be used to bleach. This however is an object of future research.

"Oil of vitriol of the proper degree of strength will bear double its quantity of water, ie, 6 of oil vitriol and 12 of water—The strength of the oil of vitriol may be known first by weighing it as one gallon will weigh lbs — 2dly by the areometer—this however is not always to be had—the common oil of vitriol may be depended on until our own experience teaches how to ascertain its qualities better—

"It is almost needless to say that the common muriatic acid and manganese will answer every purpose of oil and vitriol and salt—because first it is still more difficult to procure them than oil vitriol and secondly, it is very offensive to the health.

"The manganese and salt being separately pounded and sifted are to be mixed very intimately together so that they appear entirely as one substance.—The sulphuric acid is not to be applied till the materials are in the retort and the whole ready as the process commences instantly on its application.

"The best proportions which have been adopted on experience are 6 parts sulphuric acid—12 parts water 8 parts salt and of good manganese 3 parts—If of inferior quality more is necessary—

OF THE UTENSILS

"As it is of the utmost consequence to make the establishment useful by being cheap I should try it in the simpliest manner—both Berthollet and M Des Charmes shew the furnaces that may be used. —a common iron or even earthen pot (even if broken of little consequence for a sand bath) may be placed in a few bricks so as to have fire under it, in fact any place in which a retort or vessel can

[9]Joshua's journals record visit to Taylors, March 8-12, 1796; also, visit to other mills in Kent during this period.

[9]See Footnote 6.

[10]Actually, American sulfuric acid was first manufactured commercially in 1793 in Philadelphia by John Harrison (7).

stand in sand or water which can can be heated will do in a small work.—In a large one a furnace should be built in the middle of a room just so as to contain a hollow on its top for the insertion of the retort or retorts.

"In the large manufacturers at Manchester they use cast iron retorts lined with lead the retorts being fixed in brick work,—These retorts are very similar to the iron pots used in the vats for making paper, such pots standing on their bottoms—on the top of these retorts are fixed leaden heads formed in one piece with leaden pipes or conductors as it is of consequence to prevent having any joints if possible."

In the autumn of 1801 Joshua returned to the United States. On his return he found that his brother, Thomas, had grown to manhood and their business interests were flourishing. Particularly, the paper mill on the Brandywine had been enlarged and business was good (*2*).

Obviously, the brothers' early interest in adapting chlorine to the bleaching of rags must have been one of the principle objects of their collaboration for the next several years. Also during this period an English papermaking expert, Lawrence Greatrake, had been engaged and was probably given an interest in the mill[11]. The manuscript records indicate that Greatrake took an important part in the "Bleaching Experiments."

By April 19th, 1804, Greatrake and the Gilpins had decided to use the chlorine bleaching process of an American, Cyrus Austin, for in our records from the Gilpin Mills there is this agreement for a license to use this process:

"Agreement William Stidolph with Laurence Greatrake for Right to bleach Rags, Pulp etc at the Brandywine Paper mill under his patent—

"Whereas by virtue of a certain agreement made and signed the 19th day of April 1804—between Laurence Greatrake of Christianna hundred county of NewCastle and William Stidolph of the said County the said William Stidolph did agree in consequence of certain conditions to be performed on the part of the said Laurence Greatrake and also for the sum of five hundred dollars to be paid to him in hand as a consideration therefore, to teach the said Laurence Greatrake the art of bleaching Rags, Pulp or Paper agreadbly to the privilege of a patent under the Seal of the United States dated 14 of December 1798 granting to Cyrus Austin the exclusive right in said art agreeable thereto for fourteen years from the date an assignment whereof was made for the middle of Southern States to the said William Stidolph by the said Cyrus Austin the 13th February 1801—

"Now be it known that I the said William Stidolph for and in consideration of the said sum of five hundred dollars now paid me by the said Laurence Greatrake do hereby grant and assign unto him the compleat free use and priviledge of the rights liberties and advantages of the said Patent for bleaching Rags and Paper for the the use of the Brandywine Paper Mill Copartnership of Thomas Gilpin, Esq and also to the said Laurence Greatrake at whatever place he may conduct the business of papermaking in America and which Said Art is expressed in the Patent in the words: to wit[12]

"Whereas the method practised in England of applying the oxiginated muriatic acid for the purification of Rags and other substances used in the manufacture of Paper appeared to me capable of very great improvement in the composition and process. I set myself to a course of study and experiment and with great labor diligence and expense have discovered and perfected a method of applying the oxiginated muriatic acid to the manufacture of paper cheaper more expeditious and effectual than has been heretofore practised and known—and this method of Bleaching heretofore only applied to the unwrought material for paper is not only by my improvement rendered more expeditious cheap and perfect but may be applied with equal success to the bleaching perfecting and purifying paper itself containing in it any of the coloring or imperfection of the material wherewith paper is made—now know Ye that I Cyrus Austin of the County of Burlington State of New Jersey Paper Maker in order to obtain a patent right for the said valuable discovery and improvement in the art of bleaching the materials for paper and paper itself, do hereby make known and describe my before mentioned improvement in the following specification, that is to say—Take Rags colored or not of Cotton, Linnen, Hemp, or any other material used in making paper, wash and beat them until they are reduced to pulp, then take the material and press the water out until the quantity remaining is reduced to about the weight of the rags, then spread the material thinly on one or more frames or layers and place the frames at a small distance apart in your receiver bleaching machine or vessel which may be made of any shape or size and of any substance capable of retaining the rarified air and which is devoid of oil or metal and not subject to be affected by the Oxigene or acid—Having then closed the receiver make one or more holes in it for the purpose of receiving the end or mouth of your retort or retorts—Then to bleach 20 or 25 pounds of material take of Manganese 10 ounces Marine salt 16 ounces and mix them well previously to your putting them into your retort, when these are well mixed and put into the retort add to the mixture 30 ounces of sulphuric or vitriolic acid and when your retort which for this quantity should not be less than of two gallons, is charged, insert the mouth or end in the receiver and close it —The number of retorts depends on the size of the receiver and the quantity of materials to be bleached. They should be kept in warm water or otherwise sufficiently warmed—the bleaching will then commence;—after the retorts have been thus applied about 4 hours take them out and into each retort put a pint of warm water with about 2 oz of nitre disolved in it, shake this solution together with the ingredients remaining in the retorts which being again applied to the receiver for about 3 or 4 hours your material will be sufficiently bleached; then take it out and having dipped and washed it in water to take out the acid it will be fit for use—The foregoing proportions being observed, the effect will be the same upon any given quantity of material provided the ingredients are good and the appa-

[11] Joshua's journals at Harrisburg say that on March 22, 1796, he went on to Two Waters and sent for Lawrence Greatrake who lives at Apsley Mills and that on March 25 he visited Greatrake's mill which was old and patched.

[12] The following is the only known draft of the US Patent of Cyrus Austin for bleaching rags and paper, granted in 1798. An inquiry to the Patent Office resulted in ". . . . . Be advised this office has no printed copies of patent issued to Cyrus Austin, Dec 14, 1798; also no records are available from which we could reproduce. In all probability all records were lost in the fire." That the patent was actually granted is proven by the fact that in a "List of Patents that have been taken out of the office of the Secretary of State from July 1790, specifying the subject of the Patents with their dates, and the names of the Patentees," printed in Vol I of "The Emporium of Arts and Sciences," Philadelphia, 1812, there appears under 1798 the following entry: "Cyrus Austin, Dec 14, improvement in manufacturing paper."

ratus in perfect order, if there should be any defect in the ingredients or apparatus the operation must be repeated until the bleaching is perfect —always observing that dyed materials will require a larger proportion of the Composition than rags or material not artificially colored—The following is my method of bleaching paper—the Paper to be bleached having gone thro the several operations used in making paper, press it until the water remaining in it is about the weight of the paper, then spread the paper about half a quire thick over the pulp or over layers or frames in the receivers and apply the retorts as before in bleaching Rags; when bleached proceed to finish it in the usual manner—.[13]

"Provided however that the said Laurence Greatrake nor any of his partners of the said firm of Thomas Gilpin and Company shall instruct any person in the said art of Bleaching for any purpose or benefit than is heretofore granted or for the said Mill—under the penalty of five thousand dollars; the said obligation to continue during the term of the privilege of the said patent—

"Witness my hand this 28th day of January one thousand eight hundred and six.

William Stidolph"

By the summer of 1804 a bleaching room and equipment for the process had been installed at the Gilpin Mill, for our records include three pages of pen and ink drawings entitled, "Drafts of Bleaching Room and Apparatus at Brandywine Paper Mill Erected Summer, 1804."

The drawings indicate that a room 28 feet by 23 feet was erected for the bleaching operation. The east side of the room contained the actual bleaching apparatus itself. There were two bleaching units 12 feet long. Each unit consisted of three receivers four feet long, 2.9 feet wide and 2.6 feet high. Each receiver was fitted with three trays for holding rags or pulp, and each receiver was fed chlorine gas by one retort. The retorts were placed in a sand bath. Hot flues ran under the 12-foot lengths of the sand baths and were apparently fired from outside the building. The

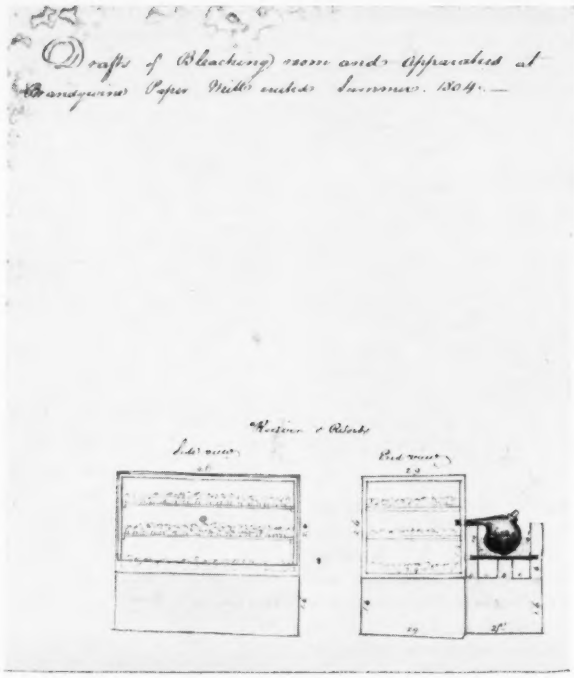


Figure 8
"Elevation" of equipment for chlorine bleaching installed at Gilpin Mills in 1804. Probably drawn by Thomas Gilpin.

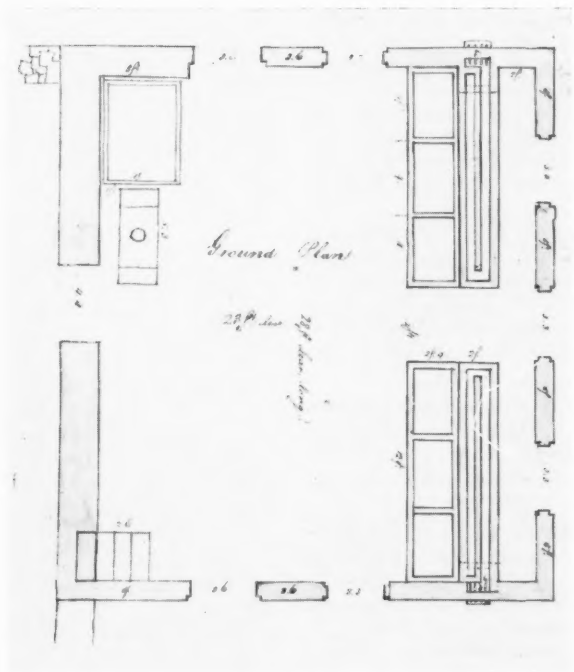


Figure 9
"Plan" of room for chlorine bleaching at Gilpin Mills in 1804.

west side of the room contained a large press for squeezing the rags and pulp. Equipment for washing the treated rags and pulp were also present in this part of the room. In full operation during one day with all receivers and retorts in action, about 200 pounds of rags or pulp could be bleached. This probably required the supervision of only one man. The actual costs for bleaching 100 pounds of colored rags in this bleaching room are given on one of the pages of our records, as follows:—

[13]It is difficult to see "Invention" in Austin's patent in view of the techniques noted by Joshua Gilpin in England at about the same time. Perhaps the bleaching of the "pulp" and the addition of nitre to the retorts may have been the "Improvements in the Art." In 1798, the rules for obtaining a US patent were not strict and any idea could simply be registered, and a patent would be granted by the Secretary of State. Austin's patent was the 218th American patent. It was the third American patent having to do with paper and the first concerned with bleaching and the first involving the manufacture or use of chlorine (*8*).

"L Greatrakes Estimate for bleaching
July . 21 . 1804

Cost of bleaching 100 lbs of colored Rags ascertained from the trial, during one week—

3. charges Manganese	2 lbs @ 5 cents	.10
3 charges Muriatic or Salt—	3 lbs @ 6/- p Bush ^{w}—	.5
3 charges Oil Vitriol	4½.. 25 cents	1.12
Labor at 6 D p Week	1.—(?) 15	1.15
Waste 5 pds on D 4 the value of 100 lbs of Rags—		.20
		2.62

"Pulp from colored Rags, very low fifths and Sails. I value at 11 cents p lb—Pulp from, good fifths and low fourths @ 15. I have no doubt the Pulp from these may be worked 1/3D into the finest papers—this however remains to be proved—at any rate a thoughtfull Steady person will be necysary to do it compleat—

"The labor would be no more charge for 200 lbs than for 100 lbs.—"

Obviously this week's run and experience indicated the good possibilities of the chlorine bleaching process. Certainly the process of Cyrus Austin was used for at least two years by the Gilpins for the dates of the License Agreement indicate this.

The Gilpin Mills continued to prosper. Thomas' technical ingenuity, curiosity and desire for improvements remained unabated. By December, 1816, after long experiments, he had invented a paper-making machine. By 1817 this machine was in operation at the mill at Brandywine. This was another 'first' for the Gilpins—the first mechanical manufacture of paper in a continuous sheet in the United States (*9*).

The prosperity of the Paper Mill did not endure for ever. In February, 1829, a great flood on the Brandywine carried its dam away, injured machinery and damaged several buildings. In April, 1825, a fire destroyed a group of the buildings and much machinery. Finally, in 1838 another flood damaged the property and equipment even more seriously than before. At this time the Gilpin Brothers decided to discontinue paper manufacture. The property was sold and was refitted for the manufacture of cotton goods (*10*).

Fortunately. Weeks, in his "History of Papermaking in the United States," has furnished us with an account of the mill by a contemporaneous writer, when it was in its prime (*11*).

"Citizens and strangers often resorted to this estate for a pleasant walk and to enjoy its beauteous scenery, as well as to see the novelty and skill of mechanism, visit the wonder-working machine that could turn out an endless sheet of paper. Papermaking is too well known to need a description. Yet, as things here were on the most approved plan, and order and neatness presided, we will venture to sketch one apartment in the old mill—a large salle on the lower floor, where more than thirty women were seated on high stools at a long table placed before the windows, each one having a knife to pick the motes from every sheet; and they were dressed becoming their occupation, with a clean apron as smooth as if an iron had just been rubbed over it. Not a cobweb marred these white walls, nor was dust allowed to soil the floors.

"Just above this, a large and modern stone building was occupied in the same way. Many departments of the business were carried on in each of these houses. The stone house below was used for assorting and cutting rags and another stone structure for extracting colors. In this, immense kettles were fixed in furnaces built of stone that seemed immovable.

"Flat boats often conveyed paper on the water from one mill to another; but it was generally taken in wagons to the Wilmington wharves. Large quantities of bank note paper were made here. We have seen whole pieces of new silk handkerchiefs cut to mix with the rags, to designate its manufacture."

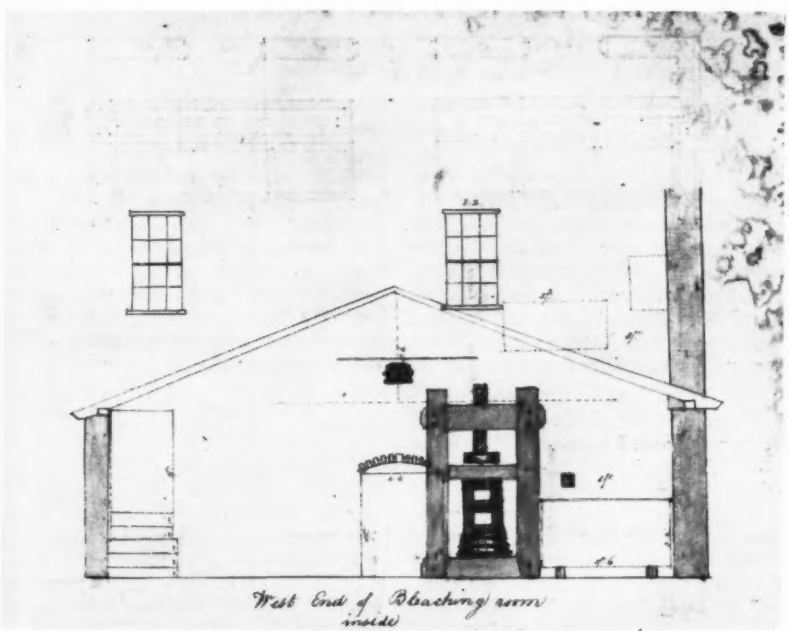


Figure 10
"Elevation" of west end of the bleaching room at Gilpin Mills in 1804.

Figure 11
Joshua Gilpin
(Courtesy Hagley Museum)

Figure 12
Thomas Gilpin
(Courtesy Hagley Museum)

Figure 13
Gilpin Paper Mills, early 19th century
(Courtesy Hagley Museum)

Joshua Gilpin died at the age of 74 and left behind a big family. Thomas died in Philadelphia in his 77th year.

A visit to the spot on the Brandywine where the Gilpin Paper Mill stood reveals no marker. In fact, the spot is now occupied by one of the buildings of a great textile bleachery. A short distance up the river, however, a beautiful Museum, devoted to the early industries on the Brandywine, gives a prominent place to the work of the two brothers. Our discovery of their introduction of chlorine to the papermaking industry of the United States adds additional luster to the Gilpin name.

ACKNOWLEDGMENT

Wyndham Miles of the Army Chemical Center and Norman B Wilkinson of the Eleutherian Mills, Hagley Foundation, have been most helpful in the preparation of this article. The author expresses his deepest thanks for their cooperation.

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• PATENT DIGEST •

PAUL WENGRAF

VAT OR SULFUR DYEING OF POLYACRYLONITRILIC FIBERS—Sodium Tetraborate Added to the Dyebath

C,4,07

U S Pat 2,890,093 (Gen Aniline & Film Corp—Mautner—June 9, 1959)

According to the preamble to this patent, the most common expedient employed for dyeing polyacrylonitrilic fibers involves the use of pressure and temperatures of at least 250°F. Under such conditions the fibers are apt to become plastic, making levelling more difficult; moreover, many vat and sulfur dyes are unstable under these severe conditions.

The present method, which can be carried out without special pressure equipment, comprises impregnation of the fibrous material containing at least 75% bw polyacrylonitrile with alkaline hydrosulfite solutions of vat or sulfur dyes to which about 8-25% sodium tetraborate bwf have been added. The vatted dyestuff solutions in themselves must be stable at 205-220°C, otherwise any vat or sulfur dyestuff may be employed. Some appropriate brands are enumerated in col 2, lines 29-41.

Examples refer to dyeings with 15 different dyestuff brands (col 4, lines 1-30). The bath ratio is given as one p fiber to 12 p liquid, containing about 10% sodium tetraborate owf. This solution is circulated in the absence of the dye through the material at 120-130°F; after 10 minutes the dyestuff in paste form is added, the temperature raised to 150°F, and caustic and hydrosulfite are stirred in, whereupon the temperature is raised to 212°F and the dye solution circulated for 60-80 minutes. Finally, the material is hot rinsed and oxidized with sodium perborate as usual. Satisfactory results in the 40-160 hrs Fade-Ometer test for lightfastness, in AATCC Wash Tests III and IV, in drycleaning and perspiration tests, etc, are reported.

Reference cited by the Patent Office:

J Textile Inst 42, 544-5 (1951): Sutton reports that, in dyeing acetate of cellulose with vat dyes, best results are obtained by treating first with dispersed unreduced dyes plus sodium formaldehyde sulfoxylate at 90-95°C. Mild alkaline substances, such as borax and sodium sulfite, were found to be effective pH regulators.

Proceedings of the
American Association of Textile Chemists and Colorists

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April 18, 1960 No. 8

AATCC Committee on Drycleaning Test Methods (RA43)——

THE DEVELOPMENT OF A NEW TEST METHOD FOR COLORFASTNESS TO DRYCLEANING

A E JOHNSON
Secretary, Committee RA43

SOON after AATCC Tentative Method 85-1957, Colorfastness to Drycleaning, was approved a manufacturer of pigment printing colors reported evidence that the test did not correlate with commercial drycleaning conditions in evaluations of pigment colorfastness. In substantiation of this report, the National Institute of Drycleaning advised that original samples of pigment-printed fabric obtained from the producer of a dress style, which was involved in numerous complaints of marked fading in drycleaning, did not lose color appreciably when tested by this method.

A number of modifications in the test were tried to improve its correlation with commercial drycleanings. These included prolonged running time, increased number of steel balls, stronger soap solution, repetition of the test, and introduction of other cloth with the specimen to increase frictional action. While repetition of the test resulted in additional color removal, the only experimental innovation in the test which gave consistently good correlation with commercially obtained results was an increase in the temperature of the test to 140°-160°F. Furthermore, the soap content at any concentration was found to have no appreciable influence on color removal, whereas the degree of removal was seen to be in direct ratio to the temperature. The test is carried out in a Launder-Ometer in 100 ml of perchlorethylene with 20 steel balls for 25 minutes at room temperature (80°F ± 2°F). (See first report of this finding by Past Chairman A E Johnson at AATCC Annual Convention, 1958, published in *American Dyestuff Reporter* of January 12, 1959).

The Committee then proceeded to check a wide range of colors submitted by two major pigment color formulators. In all, some fifty color formulas were tested. With very few exceptions, excellent correlation was obtained on pigment-print applications at 130° to 140°F and on pigment-pad colors at 140° to 160°F. The latter were not run at the lower temperature range. Also, reproducibility was good.

To discover whether a high solvent temperature would adversely affect other types of colors, or would fail to correlate accurately with actual drycleanings, tests were made on complete color samplings of acetate, nylon, Dacron, Orlon, and cotton fabrics. These included vat, direct, disperse and fiber-reactive colors. Some abnormal color behavior was observed in a navy-dyed acetate taffeta, a gold-colored acetate satin, and in two colors on Arnel tricot. A representative of acetate and Arnel interests on the Committee discounted the importance of this occurrence, attributing the condition to a removal of surface color. He advised that it is becoming a usual practice to test acetate dyeings in heated perchlorethylene as a means of determining the degree of dye penetration in the fiber. He said they regard this as the only true measure of color durability as far as drycleaning fastness is concerned although the presence of surface color does not in itself imply that there will be any difficulty in actual drycleanings under commercial conditions.

The representatives of pigment-printing interests on the Committee advised that it has been customary practice for a number of years to test their formulations in heated perchlorethylene as an accelerated test of colorfastness to drycleaning. In one case, the tests have been carried out at the boil (250°F). They agreed, on the basis of the Committee's findings, that the optimum temperature in terms of correlation with three average commercial-type drycleanings lies within the range of 130° to 160°F.

Extensive checks were also made by vat-dyeing and synthetic-fiber interests on the Committee and it was found that in no case did the new procedure at 160°F produce an adverse effect. Also, fiber-reactive dyes on cotton were found to be unaffected by this procedure.

At a meeting on June 12, 1959, the Committee carefully reviewed its entire experience in this investigation and unanimously concluded that the temperature should be established at 140°F. It also agreed that the soap requirement should be eliminated.

A draft of the proposed new test method was subsequently approved for letter ballot at a meeting of the Committee on September 10, 1959. Apart from the two changes agreed to earlier, it contained a greatly sim-

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DRYCLEANING TEST METHODS

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G M Smith
M Solomon
M W Winkler
L M Wise
L D Wyrick

plified pressing procedure. In terms of simplicity of operation and accuracy of results, the new procedure was offered as an important advance in color-evaluation technique.

The letter ballot of the Committee showed unanimous approval. But before there was time to letter-ballot the Technical Committee on Research (TCR) as authorized at a meeting of that committee on September 11, 1959, serious objections were raised by several interests for the following reasons: 1) the test was found to be affecting unrealistically certain nylon and wool colors obtained in a random sampling of piece goods and 2) the noxious effects upon laboratory personnel of perchlorethylene at the proposed temperature of 140°F.

It was subsequently demonstrated at a meeting of the Committee on November 18, 1959 that equally good correlation could be attained in two 15-minute cycles of the test at 115°F. The amount of solvent used in all test work up to this time was 100 ml. It was agreed that this temperature was satisfactory to laboratory personnel but that further work should be done in an effort to achieve a simple, one-cycle procedure.

A number of interlaboratory checks were made subsequently showing that the same good correlation originally obtained at 140°F in 100 ml of perchlorethylene for 25 minutes, and more recently obtained in a two-cycle procedure at the lower temperature, could be obtained also by increasing the solvent volume to 200 ml and running the specimen for 30 minutes at 115°F. It was further established that, at this temperature, the few colors which were shown at a disadvantage at the higher temperature were unaffected by the new procedure. In short, it was now clear that a simple test procedure had been developed which 1) correlated very closely in a broad sampling of pigment colors with three commercial drycleanings at room temperature in a 4% charged system with perchlorethylene, 2) produced no anomalous effects in a full sampling of vat, disperse and fiber-reactive colors involving all basic fiber types, 3) was simple and economical to operate, and 4) was approved as having no potentially harmful or inordinately disagreeable effects upon laboratory personnel provided usual precautions in handling solvents were taken.

At a meeting on January 21, 1960 the Committee reviewed the entire history of the project and unanimously approved the accompanying test procedure with a recommendation for its adoption by TCR. The latter committee approved the test for letter ballot on January 22, 1960.

In submitting this test for approval as a tentative test method to supersede the present procedure identified as AATCC 85-1957T, Colorfastness to Drycleaning, it is important to understand that the temperature specified in the test bears no relationship to temperatures which may exist in actual drycleaning. The temperature of 115°F is used solely as a test condition or accelerant. The correlation is with drycleanings carried out at random room temperatures (approximately 80°F ± 10°F).

A possible explanation of the efficacy of this test condition is that color loss in drycleaning is primarily the result of pigment and/or binder solubility and that the saturation point of the particular amount of solvent used at the temperature specified for the size of specimen used and the maximum amount of solubilized color and binder that may be encountered, is sufficiently high to reproduce the color loss that occurs in actual drycleaning where large volumes of solvent are employed.

Representatives of the National Institute of Drycleaning have expressed the opinion that the criteria used in this work for correlative experience under commercial conditions is realistic and that the new test provides a dependable means for evaluating the color performance of textiles in repeated drycleanings.

Tentative Test Method 85-1960 was approved by TCR in February, 1960.

COLORFASTNESS TO DRYCLEANING

Tentative Test Method

85-1960

PURPOSE AND SCOPE———This test indicates the effect of repeated (*1*) drycleanings on the color or colors in dyed and printed fabrics and other materials.

It is also applicable for evaluating dyestuffs and other coloring materials manufactured for use on fibers, yarns, fabrics, and all other products intended for apparel or household use which are renovated in consumer service by commercial drycleaning procedures.

This test is not applicable for evaluating the durability of textile finishes, or of applied designs such as metallic prints, flocking and other specialty decorative effects (*2*). Nor is it intended for use in evaluating the resistance of colors to spot and stain removal procedures used by the drycleaner.

PRINCIPLE———A specimen is agitated in a chlorinated hydrocarbon solvent with steel balls to simulate the kind of mechanical action that occurs in a commercial drycleaning machine.

APPARATUS AND MATERIALS

Launder-Ometer (*3*)
Pint glass jars (*3*)
Stainless-steel balls, ¼″ (*3*)
Perchlorethylene (*4,5*)
Hand iron, steam press or flat-bed press
International Geometric Gray Scale (*3*)

TEST SPECIMENS———Cut one test specimen 2″ × 4″ in such a manner as to include all the colors in the pattern. When this is not possible, use two or more specimens as required. Yarns and fibers may be tested under this procedure by arranging them in any practical way to produce specimens 2″ × 4″ in size.

PROCEDURE———Place 200 ml perchlorethylene (*5*) in a moisture-free Launder-Ometer jar. Enter specimen and 20 steel balls in the jar, seal, clamp in Launder-Ometer and run for 30 minutes at 115°F (46°C). Remove the specimen, blot between paper towels, air-dry at room temperature and finish as follows:

Pressing (for all except pile and heavily textured fabrics) (*6*)—Press with a hand iron or in a pressing machine until the specimen is smooth and free of wrinkles. The temperature used should be consistent with the fiber content of the specimen.

EVALUATION METHOD FOR ALTERATION IN COLOR (SHADE AND STRENGTH) (*7*)———The effect on the color (*8*) of the test specimens can be expressed and defined by reference to the International Geometric Gray Scale (see page 87, *1959 AATCC Technical Manual*).

Class 5—negligible or no change as shown in Gray Scale Step 5.

Class 4—a change in color equivalent to Gray Scale Step 4.

Class 3—a change in color equivalent to Gray Scale Step 3.

Class 2—a change in color equivalent to Gray Scale Step 2.

Class 1—a change in color equivalent to Gray Scale Step 1.

NOTES———

(1) This test is based on an extensive series of interlaboratory tests which showed there is good correlation between the test and three commercial drycleanings in a 4% charged system using perchlorethylene solvent. It has been established that results obtained in three cycles of cleaning of this type provide a good indication of the colorfastness of a dyed or printed textile in repeated commercial drycleanings of average severity.

Explanation—A temperature of 115 F is used in this test to increase the saturation point of the solvent and to otherwise act as an accelerant. It does not relate in any way to variations of temperature in actual drycleanings resulting from seasonal changes in temperature. All correlation work in the development of this test at this temperature was with drycleanings at normal prevailing room temperatures (80° ±10° F).

(2) See Tentative Test Method 86-1957: Durability of Applied Designs and Finishes to Drycleaning, which may also be used as alternative test where larger specimens are required. However, for referee cases, Tentative Test Method 85-1960: Colorfastness to Drycleaning must be used.

(3) See Table I, page 54, *1959 AATCC Technical Manual*.

(4) Perchlorethylene is used in this test because a) it is as extensively used in commercial drycleaning as Stoddard solvent, and b) it is slightly more severe in solvent action than Stoddard solvent. A material which is not affected by perchlorethylene will not be affected by petroleum solvents, whereas the reverse of this fact is not always applicable.

(5) To avoid the toxic effects of perchlorethylene, the usual precautions for handling solvents should be taken. Perchlorethylene is nonflammable but should be used only under well-ventilated conditions.

(6) Pile and heavily textured fabrics or other fabrics which might be altered physically by pressing and therefore would not ordinarily be pressed under commercial drycleaning conditions need only be air-dried.

(7) The specimen should be permitted to regain its normal moisture equilibrium prior to evaluation for color change or alteration in shade and strength.

(8) In cases of self-staining of light-colored grounds or other parts of the specimen, such staining is ignored in evaluating alteration of shade, but may be reported if desired on the basis of the AATCC Chart for Measuring Transference of Color or the Geometric Staining Scale. The means used should be indicated when reporting staining.

AATCC Committee on Dimensional Changes in Textile Fabrics (RA42)———

DIMENSIONAL CHANGES IN WOVEN OR KNITTED TEXTILES (EXCLUDING WOOL)

EDWARD ARTIM
Chairman, Committee RA42

COMMITTEE RA42
DIMENSIONAL CHANGES IN TEXTILE FABRICS

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*Immediate past chairman (1957-9)

IN 1950, AATCC Committee RA-42 (Committee on Dimensional Changes in Textile Fabrics) was faced with the need of developing adequate test methods for determining dimensional changes during laundering of an increasing number of fabric blends. Committee RA42 set a goal of developing a test method which would establish levels of launderability regardless of fiber content, fabric construction, or fabric finish.

The Committee prepared a research report entitled, "Laundering Procedures in the Commercial Laundry and in the Home," which was published in *American Dyestuff Reporter* 47, No. 6, P187-90, March 24, 1958. This information was the basis for developing the Proposed Tentative Test Method 96-1960, Dimensional Changes in Woven or Knitted Textiles (Excluding Wool). Four washing test procedures, five drying test procedures, and three restoration test procedures (summarized in Table I of the test procedure) make it possible for the person using these tests to choose the combination of practical procedures for any specific fabric or garment in order to evaluate the dimensional changes after laundering procedures used commonly in the home or commercial laundry. It is possible to describe completely every possible combination of procedures with a simple three-unit designation.

This proposed tentative test method is a combination of existing test procedures as follows:

AATCC 91-1958T, Dimensional Changes in Woven Textiles (Excluding Wool)
AATCC 95-1959T, Dimensional Restorability of Woven Textiles After Laundering
ASTM D 1470-57T, Dimensional Changes of Knit Fabrics
ASTM D 1487-57T, Shrinkage in Laundering and Dimensional Restorability of Warp Knit Fabrics
ASTM Proposed Method of Test for Dimensional Changes of Knitted Fabrics in Laundering and Dimensional Restorability of Laundered Fabric

Drip-drying and hand-ironing procedures were included to conform with methods used commonly in home laundering. Drip drying is a specified alternative method in an AATCC Wash-and-Wear Test and hand ironing is a method used in one Commercial Standard.

Draft Number 1 of this proposed tentative test method was distributed in the Spring of 1959 to AATCC Committee RA42 members and to ASTM members of the Knit Fabrics Committee along with an information ballot. Several comments and suggestions were received from both AATCC and ASTM members. Each comment was considered and letters were written to each person making comments. The Task Group on Knit Fabrics of Subcommittee B-1, Committee D-13, ASTM approved the sections concerning knitted fabrics (which were developed by ASTM) and unanimously recommended that AATCC accept the proposed method as tentative. AATCC Committee RA42 discussed and made editorial changes to Draft Number 2, and voted to submit Draft Number 3 to letter ballot of TCR.

The AATCC Committee RA42 members and ASTM members who have developed the individual test procedures and who have discussed the advisability of combining these separate test procedures into one recommended that the Technical Committee on Research approve this method as tentative. It represents many years of work by both AATCC and ASTM to develop the several individual test procedures. The one test number AATCC 96-1960 along with the three-unit description number will identify completely the exact washing, drying and restoration procedures used and will make interlaboratory communications and product performance labeling much easier.

*Tentative Test Method 96-1960 was approved by TCR in January, 1960

DIMENSIONAL CHANGES IN WOVEN OR KNITTED TEXTILES (EXCLUDING WOOL)

Tentative Test Method

96-1960

PURPOSE AND SCOPE———This test method is intended for determining the dimensional changes of woven or knitted fabrics, made of fibers other than wool, to be expected when the cloth is subjected to laundering procedures commonly used in the commercial laundry and the home. Four washing test procedures are established, varying in severity from very severe to very mild, and are intended to cover the range of practical washing from commercial procedure to hand washing. Five drying test procedures are established to cover the range of drying techniques used in the home and commercial laundry. Three methods for determining the dimensional restorability characteristics are established for those textiles which require restoration by ironing or wearing after laundering. These tests are not accelerated and must be repeated to evaluate dimensional changes after repeated launderings.

Table I summarizes all of the various washing, drying, and restoration procedures available. The person using these tests must determine which combination of procedures is practical for any specific item in order to evaluate the dimensional changes of textile fabrics or garments after laundering procedures commonly used in the home or commercial laundry. It is possible to identify the test procedure completely with a code consisting of a Roman numeral, a letter, and an Arabic number. For example Test III E 1 refers to a specimen which has been washed by procedure "III" (at 160°F for a total of 60 minutes in the machine), has been dried in a tumble dryer by procedure "E", and has been subjected to restorative forces on the tension presser by procedure "1".

PRINCIPLE———A specimen or garment is washed in a cylindrical reversing wash wheel, dried and subjected to restorative forces where necessary. Temperature and time of agitation in the wash wheel are varied to obtain different degrees of severity. Drying procedures and application of restorative force procedures are varied to conform with end-use handling during home or commercial laundering. Distances marked on the specimen in warp and filling directions (or wales and courses for knitted fabrics) are measured before and after laundering.

TABLE I

Washing Procedure	*Drying Procedure*	*Restoration Procedure*
I. 100-109°F for 30 min	A. Drip dry	1. Tension presser
II. 120-129°F for 45 min	B. Flat-bed press dry	2. Knit shrinkage gauge
III. 160-169°F for 60 min	C. Screen dry	3. Hand iron
IV. 203-212°F for 60 min	D. Line dry	
	E. Tumble dry	

APPARATUS AND MATERIALS

Wash Wheel — cylindrical wash wheel of the reversing type. The wheel (cage) is 20 to 24 inches inside diameter and 20 to 24 inches inside length. There are three fins each approximately three inches wide extending the full length of the inside of the wheel. One fin is located every 120° around the inside diameter of the wheel. The wash wheel rotates at a speed of 30 revolutions per minute making five to ten revolutions before reversing. The water inlets are large enough to permit filling the wheel to an eight-inch level in less than two minutes, and the outlet is large enough to permit discharge of this same amount of water in less than two minutes. The machine is equipped with a pipe for injecting live steam that is capable of raising the temperature of water at an eight-inch level from 100° to 140°F (38 to 60°C) in less than two minutes. The machine shall contain an opening for the insertion of a thermometer or other equivalent equipment for determining the temperature of the water during the washing and rinsing procedures. It is equipped with an outside water gage that will indicate the level of the water in the wheel (*1*).

A domestic automatic washer that will give equivalent results may be used (*2*). The wash wheel is the equipment preferred for the test.

Pressing Equipment—flat-bed press measuring 24 inches by 50 inches or larger. Any flat-bed press capable of pressing a specimen 22 inches square may be used as an alternative. The flat-bed press is maintained at a temperature not less than 275°F (135°C) (*3*) .

Dryer—dryer of the rotary tumble type, having a cylindrical basket approximately 30 inches in diameter and 24 inches in length and rotating at approximately 35 rpm. The dryer is provided with a means of maintaining a drying temperature of 120° to 160°F (49° to 71°C), measured in the exhaust vent as close as possible to the drying chamber.

Screen Drying Racks—16-mesh screening (Saran or Velon).

Drying Room—facilities for drip- or line-drying.

Extractor—centrifugal extractor of the laundry type with a perforated basket, approximately 11 inches deep by 17 inches in diameter, with an operating speed of approximately 1,500 rpm (*4*).

Pen and Ink, Indelible—or other suitable marking device (*5*).

Measuring Scale—(*5*).

Soap, Neutral Chip—Fed Spec P S 566 or ASTM D-496 (*6*).

Softener—eg, sodium metaphosphate or sodium hexametaphosphate (if needed in hard-water areas).

Detergent, Synthetic—alkylarysulfonate type (*7*).

Flatiron, Electric — approximately three pounds.

Tension Presser—consisting of a padded ironing board from which extend clamping members on all four sides. Two of the clamps are fixed to the edges of the board whereas two clamps travel on guide rails opposite the fixed clamps. The movable clamps travel on carriages which ride the rails and are drawn by dead-weight loading. Sets of weights are provided so that the load can be selected in the range of one-half to four pounds. A perforated aluminum plate, used to provide the drying surface, is heated by means of a flatiron. A special template is furnished with the apparatus to enable marking a specimen for a central measuring area and the fabric extensions to the clamps (Fig 1) (*8*).

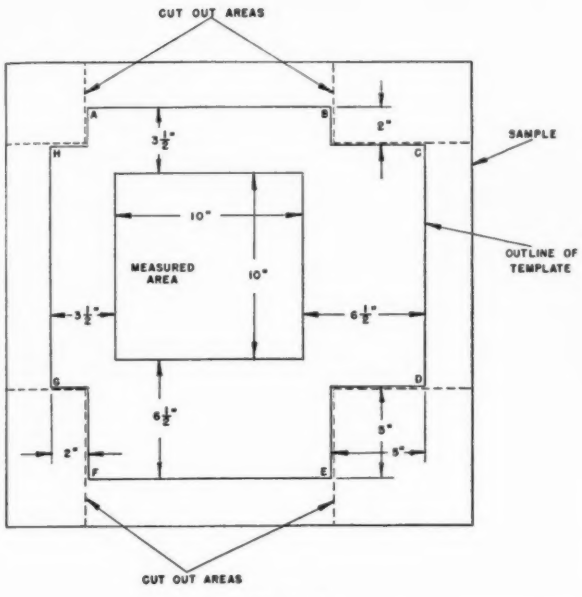


Figure 1

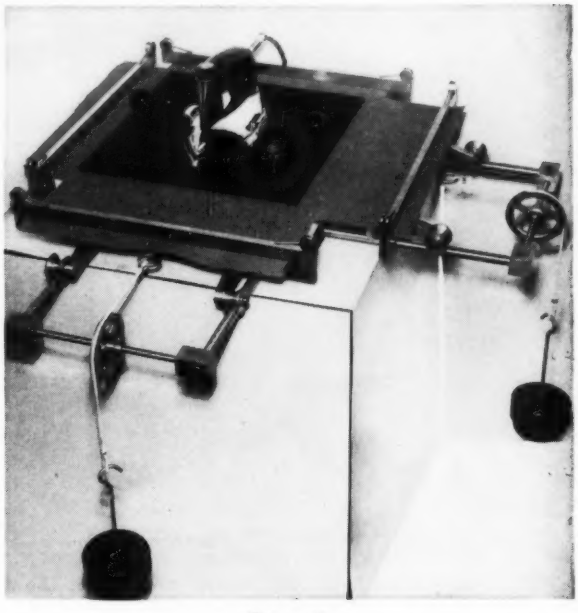


Figure 2

Knit Shrinkage Gauge—consisting of a set of 20 mounting pins set in guides in radial slots (Fig 3). Each pin is individually sprung to a tensioning member which is driven outwardly in the slot. The springs have an extension of one-inch at 16±0.5-ounce tension. The tensioning members have a common drive so that the application of restorative force takes place simultaneously in all directions in the plane of the test specimen. The minimum diameter of the pin frame in the collapsed state is 11 inches and the maximum diameter in the freely extended state (unloaded) is 14 inches. The surface of the apparatus in contact with the test specimen is uncluttered and polished so as to be as friction-free as possible (9).

TEST SPECIMENS——The preparation of test specimens will vary depending upon the type of dimensional restorability procedure (if any) to be used.

Three specimens for each sample to be tested are required in order to arrive at a satisfactory average of performance. This is especially true for knitted fabrics.

Specimens are allowed to reach moisture equilibrium with a standard atmosphere of 65 ± 2% rh and 70 ± 2°F (21 ± 1°C) and then laid out without tension on a flat, polished surface, care being taken that the fabric is free from wrinkles or creases. Fabrics that are badly distorted in their unlaundered state due to faulty finishing may give deceptive dimensional change results when laundered by any procedure. This also holds true if restorative forces are applied. Therefore, it is recommended that in such cases the sample be replaced, or if used, the results of dimensional change or dimensional restorability tests be considered as indicative only.

Generally, it is necessary to mark distances on a specimen (or garment) in both lengthwise and widthwise directions and to measure before and after laundering. The distances may be marked with indelible ink and a fine-point pen, by sewing fine threads into the fabric, or by a specially designed stamping machine. The marked distances are parallel to the respective yarns. Usually, the greater the original distances marked, the greater will be the accuracy of the test. Distances of less than 10 inches are not recommended.

Woven Fabrics to be Dried by Procedure B (Flat-Bed Pressed) or Restored by Procedure 3 (Hand Ironing). The specimen of fabric is a rectangle at least 22 by 22 inches, except for cloth narrower than 22 inches, in which case the specimen is the entire width of the fabric. Three distances, each at least 18 inches, are measured and marked off parallel to each of the warp and filling directions. The distances are at least two inches from any edge of the specimen.

Woven or Warp Knitted Fabrics to be Subjected to Restorative Procedure 1 (Tension Presser). Each specimen is at least 25″ × 25″. Place the template (Fig 1) on the fabric so that the sides of the 10-inch square cut out of the template are parallel to the warp and filling for woven fabrics, or the wales and courses for knitted fabrics, and so that the same amount of fabric extends beyond the edges of the template on all sides. Mark the specimen at the outer edges of the template with pen and *indelible ink;* also place three dots on the specimen at each side of the 10-inch square, one dot at midpoint and one at approximately one-half inch from each corner. Measure and record.

Circular Knitted Fabrics to be Subjected to Restorative Procedure 2, (Knit Shrinkage Gauge). Each specimen is approximately 16 inches square. The markings consist of a centrally located 10-inch-diameter measuring circle and a 14-inch-diameter circle of 20 dots equidistantly spaced (See Figure 3).

Garments. Critical measurements in length and width directions should be taken before and after washing, drying, and restorative procedures.

PROCEDURE——

Washing—The washing procedures are summarized in Table II.

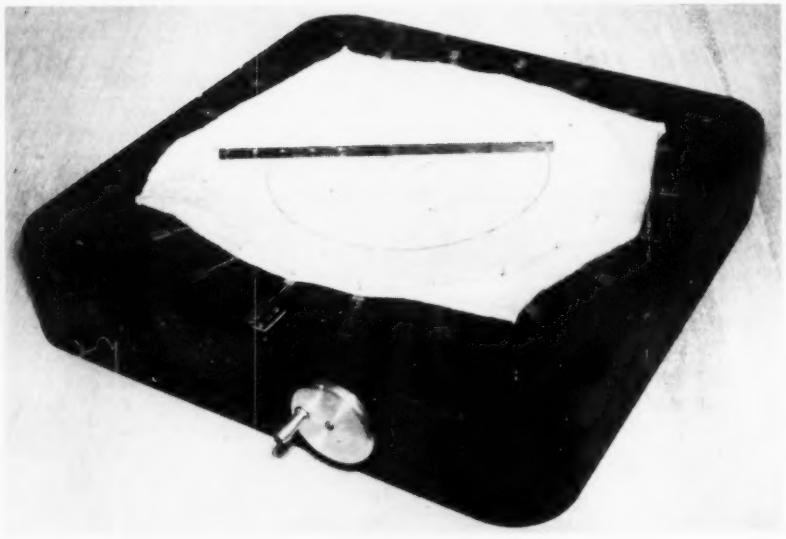


Figure 3

Place the specimen in the wash wheel with sufficient other similar fabric to make a dry load of 3 ± 0.25 pounds. Start the wash wheel and note the time. Immediately add water at 100 to 109°F (38 to 43°C) to the wheel to a level of 7 ± 0.5 inches; this level will be increased by condensed steam. When this water level has been reached, inject steam into the wheel until the temperature reaches that shown in Column B of Table II. Add sufficient soap (and softener if required to counteract hard water) to furnish a good running suds, or if desired use a synthetic detergent.

Test I. Stop the wash wheel at the end of the time shown in Column A of Table II and drain. Refill the machine to a level 8.5 ± 0.5 inches with water at 100 to 109°F (38 to 43°C) and start the machine. Inject steam, if necessary, to reach the temperature shown in Column D of Table II. Again stop the machine at the end of the time shown in Column C of Table II. This procedure is repeated for the second rinse, using the temperatures and time shown in Columns F and E of Table II.

Tests II, III, and IV. Run the machine continuously until completion of the test. Drain off the soap solution of the suds cycle at such a time that the wheel has become substantially empty of soap and water at the end of the time shown in Column A of Table II, measured from the time the wash wheel was started. Refill the machine to a level of 8.5 ± 0.5 inches with water at 100 to 109°F (38 to 43°C). When this water level has been reached, inject steam until the temperature is that shown in Column D. Drain off water at such a time that the wheel has become substantially empty of water at the end of the sum of the times shown in Columns A and C, measured from the time the wash wheel was started. Immediately refill to a level of 8.5 ± 0.5 inches with water at 100 to 109°F (38 to 43°C). When this water level has been reached inject steam until the temperature is that shown in Column F. Drain off the water at such a time that the wheel has become substantially empty of water at the end of the sum of the times shown in Columns A, C, and E measured from the time the wash wheel was started.

For Test II, the wash wheel is then stopped. For Tests III and IV, the wash wheel is then run without addition of water, and is stopped at 60 minutes from the time the wheel was started. In each of the above operations, the draining time is included in the running time.

Drying. The specimens may be dried by any one of five procedures as shown in Table III. The choice of drying procedure should be governed by the intended end use of the fabric.

TABLE II

Test No.	A Suds cycle time (mins)	B Suds cycle temp (°F)	C First rinse time (mins)	D First rinse temp (°F)	E Second rinse time (mins)	F Second rinse temp (°F)	G Wet tumble time (mins)	H Total running time (mins)
I	15	100 to 109	5	100 to 109	10	100 to 109	0	30 (Machine is stopped between cycles)
II	30	120 to 129	5	100 to 109	10	100 to 109	0	45 (Machine operates continuously)
III	40	160 to 169	5	100 to 109	10	100 to 109	5	60 (Machine operates continuously)
IV	40	203 to 212	5	140 to 149	10	140 to 149	5	60 (Machine operates continuously)

The time to fill and to drain is included in the time of the suds cycle and the two rinses in Tests II, III, and IV, in which the machine is run continuously from the start of the test.

TABLE III

Drying Procedure	Description
A	Drip dry
B	Flat-bed pressed dry
C	Screen dry
D	Line dry
E	Tumble dry

A) *Drip Dry.* Remove the specimen from the wheel (or from the automatic washer just before the water begins to drain for the final spin-dry cycle) and hang by two corners, with the warp in the vertical position, in still air at room temperature until dry. This procedure is desirable for "wash-and-wear" fabrics and garments.

B) *Flat-Bed Pressed Dry.* Remove the specimen from the wheel and centrifuge until the flow of water from the extractor has substantially ceased. If an automatic washer is used, allow the washer to complete its full rinse and spin cycles. Smooth the extracted specimens to remove wrinkles, without distorting or stretching, and press dry on the flat-bed press.

Note: An alternative drying procedure, not to be used for referee tests, is to remove the specimen from the wash wheel and squeeze out the excess water by hand. Do not wring, twist, or pass through squeeze rolls. Spread the specimen on a horizontal screen or similar perforated surface, removing wrinkles, but not distorting or stretching, and allow to dry. Then dampen the specimen with water, al-

low to stand for five minutes, and then press dry on the flat-bed press as described for the Standard Procedure.

The flat-bed press procedure does not apply to garments or knitted fabrics and is not desirable for thermoplastic synthetic fabrics.

C) *Screen Dry.* Extract the specimen as described in Procedure B (flat-bed pressed), spread on a horizontal screen or similar perforated surface, removing wrinkles, but not distorting or stretching, and allow to dry. This procedure is desirable for knitted fabrics and garments.

D) *Line Dry.* Extract the specimen as described in Procedure B (flat-bed pressed) and hang by two corners (or on a nonrusting hanger for garments) with the warp in the vertical position in still air at room temperature until dry.

This procedure is applicable for some knitted fabrics and garments and all woven fabric and garments.

E) *Tumble Dry.* Extract the specimen as described in Procedure B (flat-bed pressed) then place in a tumble dryer at 120 to 160°F (49° to 71°C) for 30 minutes, or until dry.

This procedure is applicable to fabric and garments.

Measuring. Condition the specimens from the dry side in a standard atmosphere for at least four hours or overnight before they are measured. Lay each specimen without tension on a flat, polished surface and measure to the nearest one-tenth inch the distances between the points which were originally marked off on it. Calculate the results of length and width separately to the nearest one-half percent and report as percent shrinkage.

Restorability. The specimen may be subjected to restorative forces by any one of three procedures shown in Table IV.

TABLE IV

Restoration procedure	*Description*
1	Tension presser
2	Knit shrinkage gauge
3	Hand iron

Procedure 1 (tension presser) is used for woven or warp-knitted fabrics. Procedure 2 (knit shrinkage gauge) is used for only those circular-knitted fabrics which have not stretched in either direction during laundering. Procedure 3 (hand iron) is an alternative procedure corresponding to household practice and will give the least reproducible results because of different techniques in handling and exertion of tension by operators during pressing.

Note: Hand ironing is not recommended for knitted fabrics at any time.

The flat-bed pressed specimens have been subjected to some restorative forces during drying. Such restorative forces are sufficient for the great majority of woven fabrics which do not have the property of dimensional restorability.

1a) *Tension Presser—(Woven Fabrics).* Dry the specimens by Procedure B (flat-bed pressed) and handle as follows:

After pressing on the flat-bed press, condition again for a minimum of four hours at 65 ± 2% rh and 70 ± 2°F (21 ± 1°C). Measure and record separately the dimensional change of both the warp and the filling to the nearest one-half percent. If the change exceeds two percent in either direction, proceed as follows (if the change is two percent or less in both directions, the specimen would not normally require restoration).

Cut out the corners of the specimen (indicated by dotted lines in Fig 1).

Immerse the test specimen in tap water at approximately 100°F (38°C) until thoroughly saturated. Centrifuge (*10*) lightly until the water content of the specimen is about 100 percent of its dry weight.

Place the damp specimen on the bed of the tension presser (Fig 2) so that the marked lines (AB and GH in Fig 1) on the two short flaps are between the fixed clamps. In the same manner, place the longer flaps so that the marked lines (CD and EF in Fig 1) are between the movable clamps.

If necessary, stretch that portion of the fabric entering the clamp so that it fills the width of the clamp, being careful to avoid distortion of the measuring area in the process.

TABLE V

Dimensional changes as obtained after flat-bed pressing	*Calibrated weight to be applied on tension presser (lbs)*
Any gain through 1.0% loss	0.5
1.1-3.0% loss	1.0
3.1-5.0% loss	3.0
over 5.0% loss	4.0

Using the figures as given in Table V, select the proper weights for both the warp and filling directions.

Apply the selected weights to both warp and filling simultaneously and gently. Allow the specimen to remain under this fixed tension during the drying operation. Preheat the perforated drying plate by placing on it a heated flatiron until the temperature of the plate is approximately 300°F (149°C). Then place the heated plate (with the iron maintained at a temperature of 300°F (149°C) *centrally located* on the plate) on the specimen which is under tension on the bed of the tension presser. Do *not* apply pressure to the iron.

After 10 seconds, lift the flatiron and the plate for five seconds to allow steam to escape and then replace the assembly for another 10 seconds. Again lift the assembly for five seconds. This procedure is repeated as many times as necessary until no appreciable steam is released from the fabric and the specimen is completely dry.

Remove the weights simultaneously, unfasten the fabric clamps and carefully remove the specimen from the tension presser in such a way that the specimen is not distorted. Press the *end tabs* of the specimen with the flatiron, being careful not to distort the 10″ center square. Allow the specimen to lie flat without any stresses or strains under standard conditions of 65 ± 2% rh and 70 ± 2°F (21 ± 1°C) for a minimum of four hours before measuring. Calculate the averages of length and width measurements separately to the nearest one-half and report as percent shrinkage.

1b) *Tension Presser (Warp Knitted Fabrics).* Dry the specimens by Drying Procedure E (tumble dry) and handle as follows:

Cut out the corners of the laundered and tumble-dried test specimen along the dotted lines shown in Fig 1 so that the fabric has two short and two long flaps. (Do not cut along the 13-inch dimension of each flap marked AB, CD, EF, and GH in Fig 1.) Then immerse the specimens in tap

water for 15 minutes or until completely wet out. Centrifuge lightly (30 seconds), and roll the specimens in a Turkish towel, being careful not to distort the fabric.

Remove after five minutes and place a damp specimen on the tension presser so that two short flaps are between the fixed clamps with the marked lines, AB and GH, under the clamps. Fix the longer flaps in the movable clamp bars in the same way, except that the edges are flared out to as near the original measurement as possible. Apply one-pound weights to both directions gently and simultaneously and allow the specimen to remain under this fixed tension until dry. To dry a specimen place the preheated perforated drying plate on the fabric with the flatiron at a temperature of 300°F (149°C) on top of it (see Fig 2). Lift the iron and plate off the specimen after about 10 seconds and allow the steam to escape for five seconds, then replace them on the specimen. Repeat this procedure until no appreciable steam is released. Then replace the plate and iron on the specimen and allow to remain until it is completely dry. Remove the weights, unclamp the bars, and carefully remove the specimen from the apparatus being careful not to distort the fabric.

Press the tabs of the specimen with the flatiron, taking care not to distort the 10-inch center square. Allow the specimen to lie flat under standard conditions for four hours or overnight. Then measure the 10-inch square of the specimen at the three marked points in each direction. Calculate the averages of length and width dimensional changes separately and report to the nearest one-half percent as percent shrinkage under a stated load.

2) *Knit Shrinkage Gauge.* After laundering and drying, allow the specimen to lie flat without any stresses or strains under standard conditions of 65 ± 2% rh and 70 ± 2° F (21 ± 1°C) for a minimum of four hours before mounting on the pin frame which is in the fully collapsed state. To mount a specimen, insert a pin in each of the 20 premarked points in its perimeter. Operate the hand wheel drive mechanism to bring the tensioning members to their outer extremities at a smooth and uniform rate. Take three measurements in each direction with the first of each in a direct line along the central wale or course. Take the two additional measurements by pivoting around the center of the test specimen approximately three-quarters inch on each side of the first. Take readings to the nearest one-half percent on the direct measuring scale. Calculate separately and report to the nearest one-half percent the shrinkage in each direction.

3) *Hand Iron.* Hand ironing is the least desirable and least reproducible method for determining restoration characteristics of textiles. It is intended primarily for evaluation of garments which require ironing to remove wrinkles prior to wearing. Hand ironing is not recommended for knitted fabrics or garments. The dry specimen or garment may be sprinkled with water and rolled in a towel for one hour. The dampened specimen is placed on a padded ironing board and pressed until dry with a flatiron having a temperature of approximately 300°F (149°C). The dry specimen or garment may be ironed with a steam iron. Exert only that tension during pressing which is necessary to reshape and restore the specimen to its original dimensions. Allow the specimen to lie flat without any stresses or strains under standard conditions of 65 ± 2% rh and 70 ± 2°F (21 ± 1°C) for a minimum of four hours before measuring. Garments should be hung to condition. Calculate the averages of length and width measurements separately to the nearest one-half percent and report as percent shrinkage.

EVALUATION———

Calculation. The shrinkage in each direction is calculated as follows:

$$\% \text{ Shrinkage} = \frac{\text{original measurement} - \text{final measurement}}{\text{original measurement}} \times 100$$

where both original and final measurements are the averages of the measurements made on the specimen. A *gain* in laundering (when final measurements are larger than original measurements) is customarily expressed by the use of a + sign.

REPORTING———In addition to the reporting separately to the nearest one-half percent the shrinkage of both length and width, the report should specify the complete test procedure used by giving the Roman numeral defining the washing procedure, the capital letter defining the drying procedure, and the Arabic number defining the restorative procedure (if any).

NOTES———

(*1*) Washing machines of the type descriped may be obtained from American Laundry Machinery Co, Cincinnati, O; Robert Ewing & Sons Co, Green Island, NY; Smith, Drum Div, Turbo Machine Co, Lansdale, Pa; or Hurley Machine Co, 22nd St & 54th Ave, Chicago, Ill.

(*2*) Various brands of automatic domestic washers have been found to give equivalent results.

(*3*) Pressing equipment of the type described may be obtained from: Pantex Co, Pawtucket, RI (flat-plate press, Model FPR-60); Prosperity Co, Syracuse, NY (flat-plate press, Model 160 PC); and United States Testing Co, Inc, 1415 Park Ave, Hoboken, NJ (flat-plate press, Model 6584).

(*4*) Extracting machines of the type described may be obtained from Bock Laundry Machine Co, Toledo, O (Model 24BC); American Laundry Machinery Co, Cincinnati, O.

(*5*) A mechanical marking device and a measuring tape, calibrated directly in percent dimensional change, may be obtained from Sanforized Div, Cluett, Peabody & Co, Inc, Troy, NY.

(*6*) A stock solution of the soap (Fed Spec P-S-566 or ASTM D496—sodium oleate) may be prepared by dissolving one pound of chip soap in one gallon of hot water. When cooled, this forms a thick homogeneous jelly which may be used as required.

(*7*) Alkylarylsulfonate synthetic detergents are available under varying tradenames from almost all suppliers of detergents.

(*8*) Tension presser is available from the United States Testing Co, Inc, 1415 Park Ave, Hoboken, NJ.

(*9*) Knit shrinkage gauge is available from the United States Testing Co, Inc, 1415 Park Ave, Hoboken, NJ.

(*10*) Gentle hand squeezing (so as not to distort fabric specimen) may be used in lieu of a centrifuge if the latter is not available.

(*11*) Temperature can be measured with a surface pyrometer or appropriate Tempil Stiks (Cenco No. 13756).

See "Relaxation and Felting Shrinkage of Woven or Knitted Wool Textiles" by Committee RA42 on pages 68 and 69 of this issue

Metropolitan, Delaware Valley, Mid-West———

THE I-T PROCESS FOR APPLYING CATIONIC DYES TO ACRYLIC FIBERS*

J A LEDDY
Geigy Dyestuffs
Division of Geigy Chemical Corp
Ardsley, NY

INTRODUCTION

THE tremendous growth of new synthetic fibers in the past ten years has created quite a problem for textile chemists and colorists. Previous to World War II, mastering the dyeing techniques of a handful of natural fibers and a few synthetics sufficed, whereas today it is a problem to keep abreast of the developments in a single field, such as acrylics. Troublesome as this situation is for all concerned with dyeing and finishing, we can at least say that boredom is non-existant and that our role in the textile industry is necessarily more vital and important.

Inasmuch as the field of synthetic wet processing has become so complicated, it is best to restrict discussion to one specific phase of the dyeing of certain acrylic fibers and blends; namely, to the all-important dyeing systems used to aid levelness and penetration with cationic dyestuffs and to present a few details of an approach developed several years ago in the laboratories of J R Geigy Company in Switzerland, which for brevity's sake is termed the I-T Process.

DISCUSSION

No matter what fiber is being processed, or what dyestuff is employed, problems of levelness and penetration can occur. These problems arise from various causes, one of which is the inherent drawing properties of the dyestuffs. The dyer can do nothing to alter the dyestuff chemically, but he has various tools at his command, such as additions to the dyebath, pH control, temperature control and equipment manipulation.

At the risk of oversimplification, we will discuss two general approaches which are normally encountered in the retarding and leveling of dyestuffs. The techniques involve consideration of the anionic, nonionic, and cationic natures of the dyestuffs and auxiliaries.

GENERAL APPROACHES——— The first principle involves the use of a leveling auxiliary of the same class as the dyestuff employed, ie, an anionic agent with an anionic dyestuff or a cationic agent with a cationic dyestuff.

The general theory of this principle is the utilization of an auxiliary that competes with the dyestuff for the available dye sites in the fiber.

This method has been widely employed for many years in the dyeing of wool or nylon and has been quite standard for the dyeing of Orlon 42, as many quaternary compounds have a decidely beneficial action when dyeing this fiber with basic dyestuffs.

The second principle is to use a levelling agent of the opposite type to the dyestuff, with the object of forming complexes with the dyestuff to reduce the rate of drawing.

The I-T method falls into this second category. The "I" stands for Irgasol DA, an anionic agent which forms complexes with cationic dyestuffs. The "T" stands for Tinegal NA, a nonionic agent which has no appreciable effect on the rate of drawing of cationic dyestuffs, but which is helpful in keeping the cationic/anionic complexes in a state of colloidal dispersion.

Figure 1 shows, in diagramatic form, the general philosophy of the I-T method.

The cationic dye reacts with the anionic agent to form a cationic/anionic complex. The nonionic maintains this complex in a finely divided state throughout the dyeing cycle. At temperatures below the boil, this complex is very loosely bonded to the fiber, thereby permitting some migration or leveling on the surface of the material. As the temperature rises, this evenly distributed loose complex breaks down, allowing the dyestuff to diffuse into the fiber, while the anionic retarding agent and the nonionic emulsifying agent remain active in the dyebath.

Although it is our belief that we have pioneered this approach in the

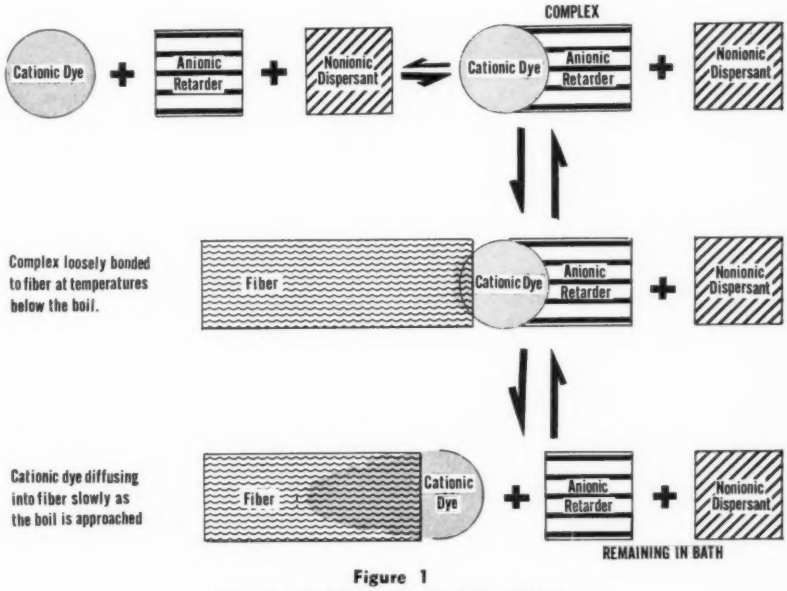

COMPLEX
Cationic Dye
Anionic Retarder
Nonionic Dispersant
Complex loosely bonded to fiber at temperatures below the boil.
Fiber
Cationic dye diffusing into fiber slowly as the boil is approached
REMAINING IN BATH

Figure 1
General philosophy of the I-T method

*Presented before the Metropolitan Section on Sept 18, 1959 at Ardsley, NY; before the Delaware Valley Section on Oct 23, 1959 at Philadelphia, Pa; before tthe Mid-West Section on Feb 6, 1960 at Chicago, Ill; and before the Niagara Frontier Section at St Catherines, Ont on Mar 4, 1960

dyeing of acryilcs, it should be acknowledged that the fundamental idea of retarding by complexing has been the subject of much development work in other fields of dyeing.

Perhaps the foregoing illustration has given the impression that this is a complicated matter. To the contrary, it is very simple in practice. The general I-T procedure for dyeing Orlon 42 with cationic dyestuffs starts with the preparation of the dyebath at 160°F. To this bath is added the anionic Irgasol DA and the nonionic Tinegal NA as well as the usual sodium acetate and acetic acid.

The material is run for a short time to ensure uniform conditions throughout the dyebath. The dye is then added, and the temperature raised slowly to the boil, and the bath boiled for a normal dyeing time.

The quantity of Irgasol DA is varied as needed. In general, more is necessary for leveling of light shades than for heavy shades. The normal range of concentration is from 2.0% owf for pastels to 0.5% owf for full shades. Other anionics may have value, but we have found Irgasol DA to possess the proper all-round complexing features and good working properties at very reasonable cost.

Although we have not tested a wide range of nonionics, no doubt a large number are satisfactory. As previously mentioned, our tests indicate that Tinegal NA plays practically no part in the retarding mechanism, but contributes greatly to maintaining a clean dyebath. From 2.0-3.0% owf is usually adequate.

It might also be mentioned that very little dyestuff complex tends to draw below 180°F; therefore, the temperature may be raised rather rapidly to this point, but should be raised very slowly from 180°F to the boil.

Similarly, shading additions are best made at 180°F, which presents no difficulty as the steam is merely cut off when sampling, and the temperature normally drops to 180°F before the feed-on is ready. Many dyers make a practice of running for 15 to 30 minutes at 190°F in order to utilize optimum temperature control.

Regardless of theory, the proof of the pudding is in the eating. A few illustrations will show what can be expected when the I-T process is employed for the dyeing of Orlon 42 with modern basic dyestuffs.

Figures 2, 3 and 4 show time-temperature dyeings of three selected dyestuffs with the I-T process as compared with a conventional cationic retarder. These dyestuffs have been chosen because of fundamental differences in their drawing properties. Maxilon Red BL is a slow-drawing dyestuff; Maxilon Brilliant Yellow 5GL is a medium-drawing dyestuff; and Maxilon Blue RLA is a fast-drawing dyestuff.

Each illustration shows on the top line dyeings made by the I-T method, and on the bottom line dyeings made by a cationic retarder method.

Figure 2 shows 0.75% of Maxilon Red BL, which is a slow-drawing dyestuff. If we examine the I-T dyeings, we see that the complex has started to show affinity at 190°F. After running 30 minutes at 190°F, approximately 60% of the dye is on the fiber. over the 15-minute period required to reach 212°F, approximately 25% more dye has been absorbed. The remaining portion of the dye is taken up uniformly over the next 30 minutes at the boil. No sharp uptake of dye occurs throughout the cycle. If we examine the cationic retarder dyeings, we see that very little dyeing has taken place up to the boil. However, after 15 minutes boiling, approximately 75% of the dye has been absorbed. The depth of shade by both methods is ultimately the same.

If we refer to Figure 3, we see a 0.5% dyeing of Maxilon Brilliant Yellow 5GL, which is a medium-drawing dyestuff. On examination, it is seen that the picture closely resembles Figure 2. By the I-T method, dyeing continues uniformly from 190° F to the boil, while by the cationic retarder system, dyeing takes place rather rapidly after the boil has been reached.

Referring now to Figure 4, we have a 1.60% dyeing of Maxilon Blue RLA, which is a fast-drawing dyestuff. By the I-T method, dyeing commences at 190°F, but after 30 minutes at 190°F, both methods show substantial dyeing. On reaching the boil, both dyeings are of equal depth.

Other modified basic dyes show similar behavior to the three test colors we have just seen. The I-T method shows a more uniform drawing rate in the early stages of dyeing, the cationic retarder method tending to hold off until the boil has been reached. This basic difference in the two methods is even more strikingly shown when similar tests are made with combinations of dyes.

Figure 5 shows a violet combination made with 0.03% Maxilon Red BL and 0.25% Maxilon Blue RLA. It can be seen that, by the I-T method, dyeing commences at 190°F *as a violet* and proceeds to dye slowly *as a violet* until at the boil it has reached full exhaustion.

By the cationic retarding method, the faster-drawing blue element commences dyeing at 190°F. No red is apparent at this stage, but during the first 15 minutes of boiling, the red element goes on rapidly to give the required violet shade. The final shade of both dyeings is the same.

Figure 6 shows a green shade made with a combination of 0.40% Maxilon Brilliant Yellow 5GL and 1.75% Maxilon Blue RLA. Here again, the I-T method dyes as a green throughout the cycle, while the cationic retarder method starts out as a blue, and only becomes a green after the boil has been reached.

Figure 7 shows a tan shade made with a three-color combination: 0.155% Maxilon Brilliant Yellow 5GL, 0.075% Maxilon Blue RLA, and 0.035% Maxilon Red BL.

Without going into detail, it can be said that by the I-T method all three dyes draw fairly uniformly, but by the cationic method drawing rates differ.

SHADING ADDITIONS

Shading is the most critical point of all dyeing, the measure of a dyeing system often being whether it is possible to make shading additions both with ease and assurance of level dyeing.

In order to demonstrate this point, several packages were dyed by the I-T Method. Packages "A" and "B" were dyed with a mixture of the slow-drawing Maxilon Red BL and the fast-drawing Maxilon Blue RLA. Package "A" had both dyestuffs added initially, and a normal I-T dyeing cycle completed. Package "B" was started with only the slow-drawing red element. A normal I-T dyeing cycle was carried out, the temperature dropped to 180°F, and the fast-drawing blue added; thereafter the temperature was raised to the boil until exhaustion was obtained. The final result showed both dyeings to be identical in shade.

The same procedure was carried out with a mixture of the medium-drawing Maxilon Brilliant Yellow 5GL and the fast-drawing Maxilon Blue RLA. Package "C" had both colors added initially, and package "D" demonstrated the feed-on of fast-drawing blue. Again, both shades were identical.

FIGURE 12
I-T Method

JJ — 0.25% CI Acid Orange 63 133%.
KK — 0.25% CI Acid Red 57.
LL — 0.5% CI Acid Violet 48.
MM — 0.25% CI Acid Green 25.
NN — 0.0125% CI Acid Red 57; 0.025% CI Acid Blue 78; 0.05% CI Acid Black 48.

FIGURE 11
I. T. Method

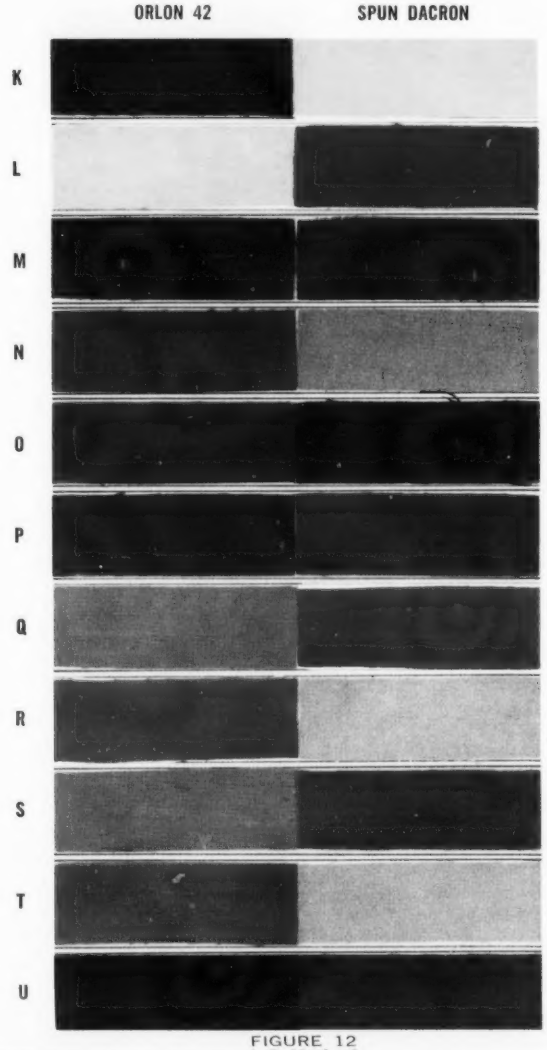


FIGURE 12
I. T. Method

I. T. Method

A — 2.0% Maxilon Blue GLA; 0.5% CI Acid Red 57.
B — 3.5% Maxilon Blue GLA; 1.0% Maxilon Brill. Yellow 5GL; 0.5% CI Acid Red 99 125%.
C — 2.25% Maxilon Blue GLA; 1.5% Maxilon Brill. Yellow 5GL; 0.45% Maxilon Red BL; 0.03% CI Acid Blue 80 110%; 0.15% Irganol Brill. Yellow 3GLS; 0.07% CI Acid Red 57.
D — 2.0% Maxilon Blue GLA.
E — 0.5% Maxilon Brill. Yellow 5GL.
F — 1.0% Maxilon Red BL.
G — 0.005% Maxilon Red BL; 0.5% Maxilon Blue GLA; 0.1% CI Acid Blue 67 Conc. 150%.
H — 1.0% Maxilon Red BL; 0.5% Maxilon Brill. Yellow 5GL; 1.0% CI Acid Red 57; 0.5% CI Acid Yellow 40 Conc.
I — 0.15% Maxilon Brill. Yellow 5GL; 0.15% Polar Yellow 5G Conc.
J — 1.3% Maxilon Blue 5G; 2.7% Maxilon Brill. Yellow 5GL; 1.1% Maxilon Red BL; 0.1% Acid Blue 78; 0.8% CI Acid Yellow 40; 0.72% CI Acid Red 57.
K — 0.50% CI Disperse Yellow 8 200%; 0.25% Maxilon Red BL; 0.75% Maxilon Blue GLA.
L — 0.25% CI Disperse Yellow 8 200%; 0.50% Setacyl Scarlet P-GBL; 1.25% Maxilon Brill. Yellow 5GL.
M — 1.0% Setacyl Scarlet P-GBL; 0.50% Maxilon Brill. Yellow 5GL; 1.0% Maxilon Blue GLA.
N — 0.04% CI Disperse Yellow 8 200%; 0.04% Setacyl Scarlet P-GBL; 0.03% Setacyl Blue BFL; 1.0% Maxilon Red BL.
O — 1.25% Setacyl Blue BFL; 1.0% Maxilon Brill. Yellow 5GL; 0.35% Maxilon Red BL.
P — 0.012% CI Disperse Yellow 8 200%; 0.02% Setacyl Scarlet P-GBL; 0.16% Setacyl Blue BFL; 2.0% Maxilon Blue GLA.
Q — 0.05% CI Disperse Yellow 8 200%; 0.45% Setacyl Scarlet P-GBL; 0.16% Maxilon Brill. Yellow 5GL; 0.042% Maxilon Red BL; 0.10% Maxilon Blue GLA.
R — 0.035% CI Disperse Yellow 8 200%; 0.023% Setacyl Scarlet P-GBL; 0.018% Setacyl Blue BFL; 0.57% Maxilon Brill. Yellow 5GL; 0.24% Maxilon Red BL; 0.008% Maxilon Blue GLA.
S — 0.012% CI Disperse Yellow 8 200%; 0.02% Setacyl Scarlet P-GBL; 0.16% Setacyl Blue BFL; 0.16% Maxilon Brill. Yellow 5GL; 0.042% Maxilon Red BL; 0.10% Maxilon Blue GLA.
T — 0.035% CI Disperse Yellow 8 200%; 0.023% Setacyl Scarlet P-GBL; 0.018% Setacyl Blue BFL; 0.03% Maxilon Brill. Yellow 5GL; 0.022% Maxilon Red Bl 0.35% Maxilon Blue GLA.
U — 0.9% Maxilon Blue RLA; 1.5% Maxilon Blue 5G; 0.6% Maxilon Red BL; 1.2%. Maxilon Brill. Yellow 5GL; 0.15% Maxilon Orange G; 0.4% Setacyl Violet P-2B.
V — 0.75% Maxilon Blue 5G; 1.0% CI Direct Yellow 50.
W — 0.75% Maxilon Blue 5G; 1.5% CI Direct Red 24 200%.
X — 0.75% Maxilon Brill. Yellow 5GL; 1.0% Solophenyl Blue 8GL.
Y — 0.75% Maxilon Brill. Yellow 5GL; 1.5% CI Direct Red 80.
Z — 0.5% Maxilon Red BL; 1.0% CI Direct Yellow 44 conc.
AA — 0.5% Maxilon Red BL; 1.0% Diphenyl Fast Orange LF.
BB — 0.5% Maxilon Red BL; 1.5% Solophenyl Green A2GL.
CC — Pure White.
DD — 0.125% CI Disperse Yellow 3.
EE — 0.125% CI Disperse Red 20.
FF — 0.15% CI Disperse Violet 1.
GG — 0.5% Gycoluce Brill. Green 5GN.
HH — 0.3% CI Disperse Red 5.
II — Pure White.
JJ — 0.25% CI Acid Orange 63 133%.
KK — 0.25% CI Acid Red 57.
LL — 0.5% CI Acid Violet 48.
MM — 0.25% CI Acid Green 25.
NN — 0.0125% CI Acid Red 57; 0.025% CI Acid Blue 78; 0.05% CI Acid Black 48.

1.6% Maxilon Blue RLA

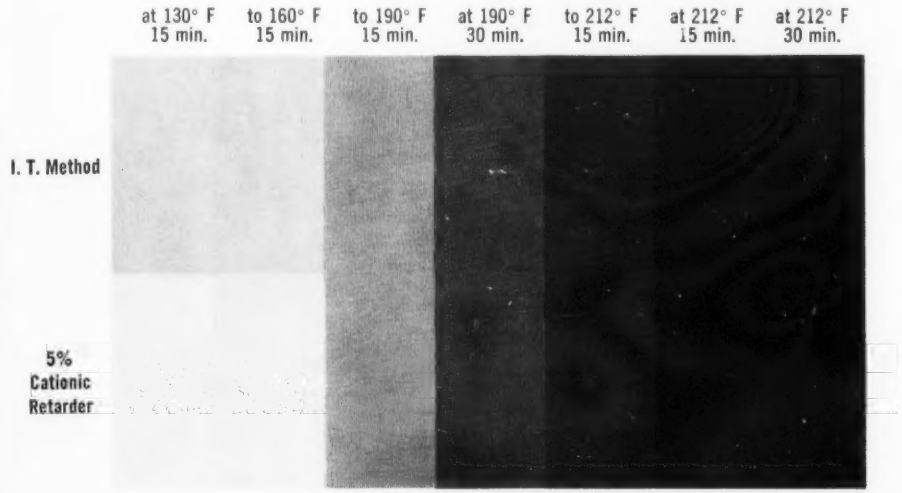

at 130° F 15 min.
to 160° F 15 min.
to 190° F 15 min.
at 190° F 30 min.
to 212° F 15 min.
at 212° F 15 min.
at 212° F 30 min.
I. T. Method
5% Cationic Retarder

FIGURE 6
0.4% Maxilon Brilliant Yellow 5GL; 1.75% Maxilon Blue RLA

0.03% Maxilon Red BL; 0.25% Maxilon Blue RLA

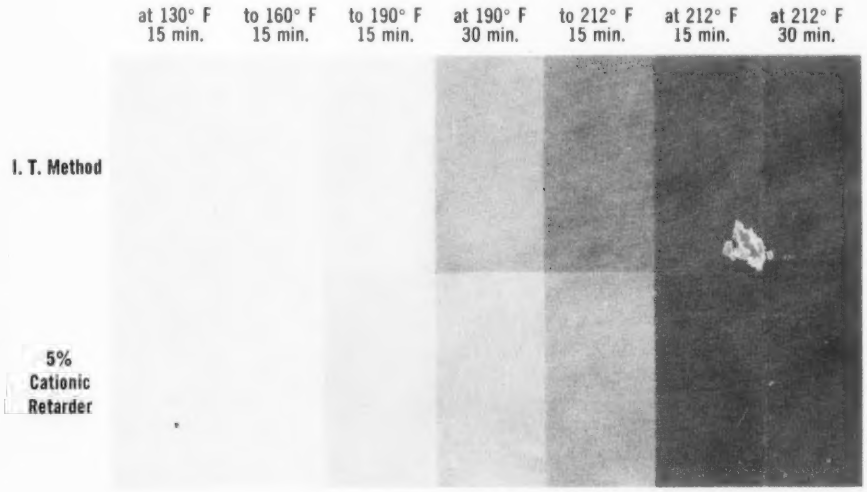
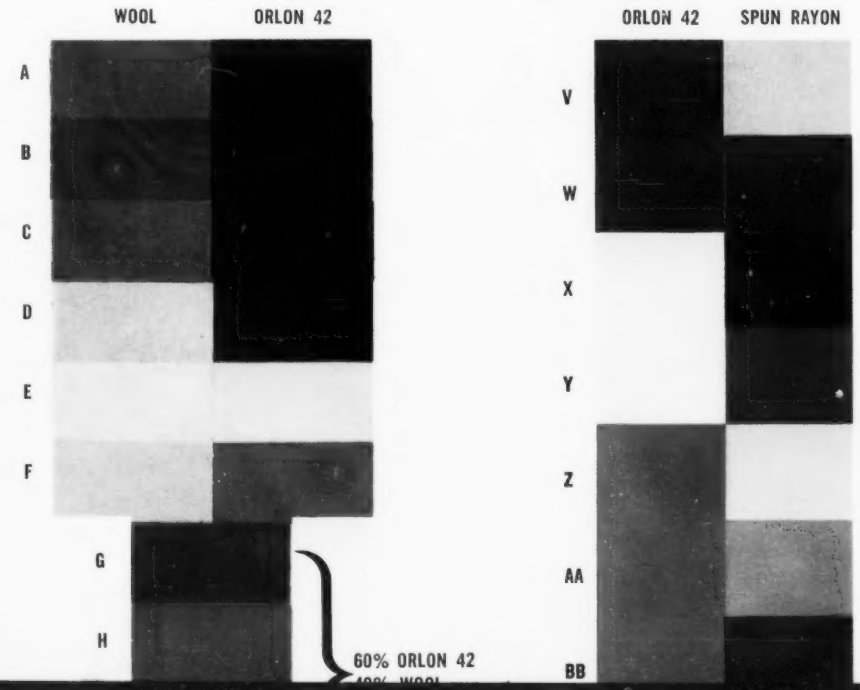
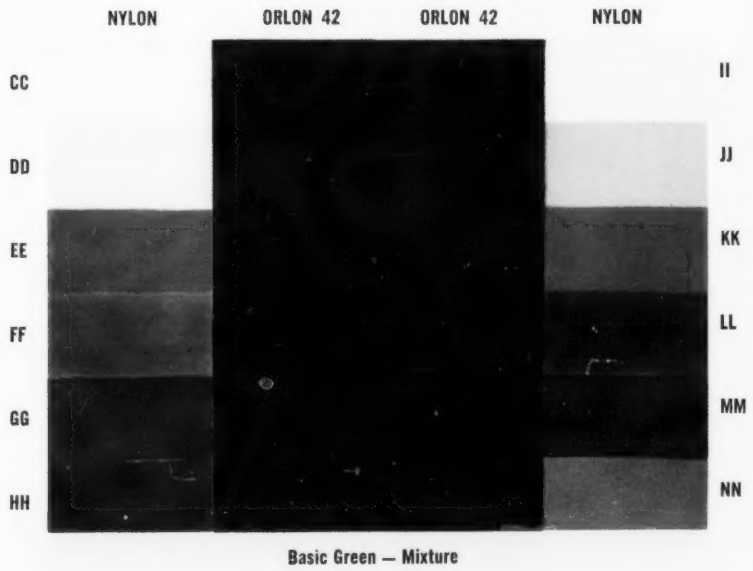

at 130° F 15 min.
to 160° F 15 min.
to 190° F 15 min.
at 190° F 30 min.
to 212° F 15 min.
at 212° F 15 min.
at 212° F 30 min.
I. T. Method
5% Cationic Retarder

FIGURE 7
0.155% Maxilon Brilliant Yellow 5GL; 0.075% Maxilon Blue RLA
0.035% Maxilon Red BL





Basic Green — Mixture

FIGURE 14
I. T. Method

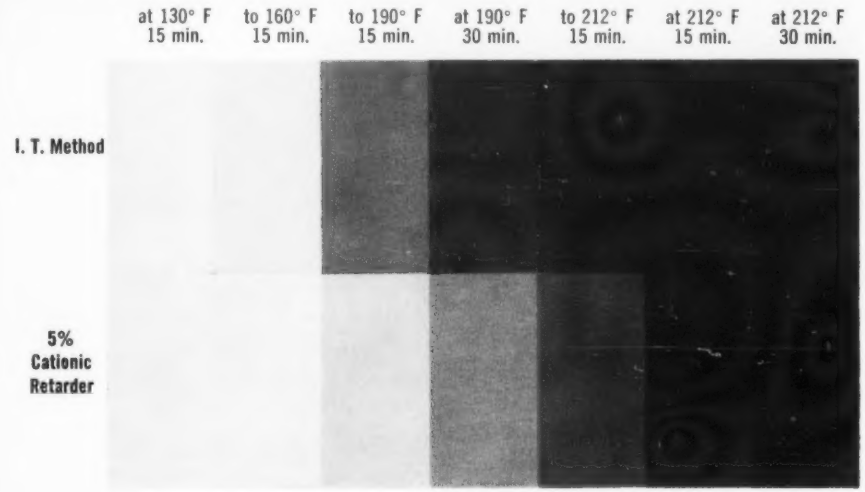
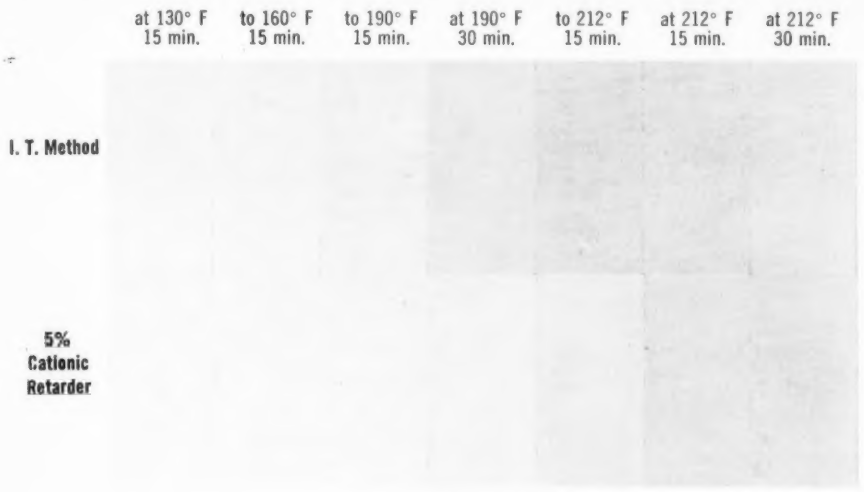

at 130° F 15 min.
to 160° F 15 min.
to 190° F 15 min.
at 190° F 30 min.
to 212° F 15 min.
at 212° F 15 min.
at 212° F 30 min.
I. T. Method
5% Cationic Retarder

FIGURE 2
0.75% Maxilon Red BL


at 130° F 15 min.
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to 212° F 15 min.
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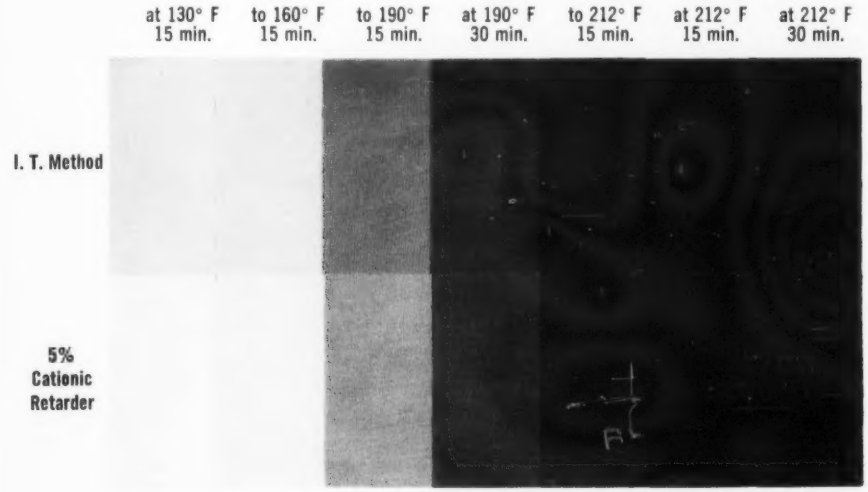
at 212° F 30 min.
I. T. Method
5% Cationic Retarder

FIGURE 3
0.5% Maxilon Brilliant Yellow 5GL


at 130° F 15 min.
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at 190° F 30 min.
to 212° F 15 min.
at 212° F 15 min.
at 212° F 30 min.
I. T. Method
5% Cationic Retarder

FIGURE 4
1.6% Maxilon Blue RLA

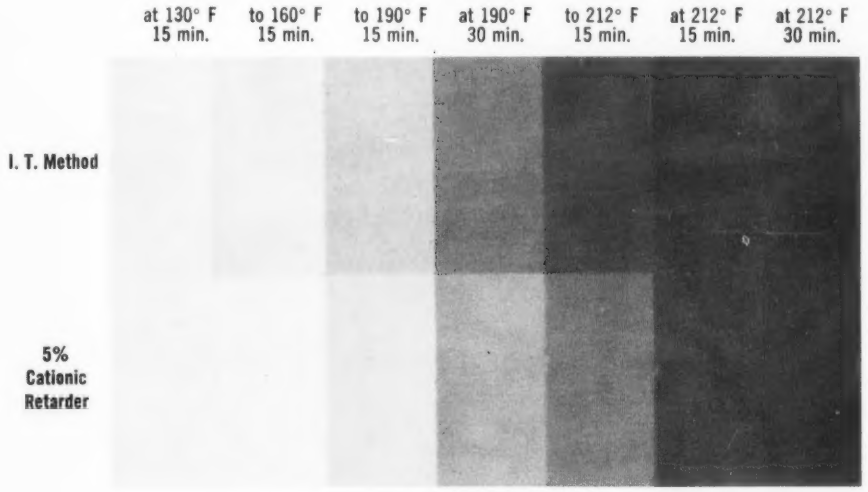
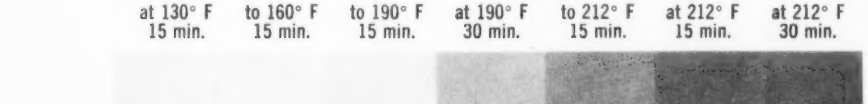

at 130° F 15 min.
to 160° F 15 min.
to 190° F 15 min.
at 190° F 30 min.
to 212° F 15 min.
at 212° F 15 min.
at 212° F 30 min.
I. T. Method
5% Cationic Retarder

FIGURE 5
0.03% Maxilon Red BL; 0.25% Maxilon Blue RLA



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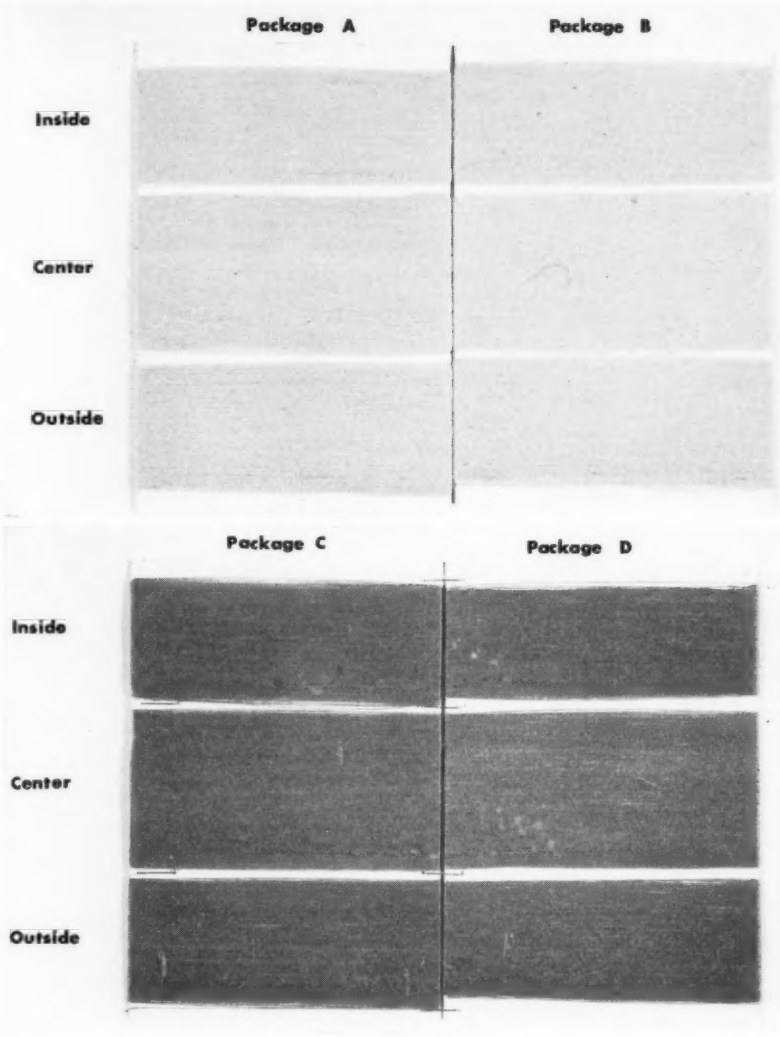

Figure 8

Figure 8 shows a mounting of skeins back-wound from these packages to illustrate inside, center, and outside.

It can be seen that there is no variation in shade throughout the packages, even when an addition of fast-drawing cationic dye is made.

As these dyeings were made in quite short liquor ratio, it demonstrates that additions can be made with an assurance of levelness.

While on the subject of shading colors, a few words should be said regarding additions of disperse dyes to cationic dye systems. When only small shading corrections have to be made, many dyers prefer to use disperse dyes. By the I-T method, we know of no instance where these dyes are incompatible. In fact, in Europe our colleagues often use cationic and disperse dyes in the same formulation.

In order to make an appraisal of the data so far presented, a brief summary would be in order at this point.

1) When dyeing acrylic fibers with cationic dyes by the I-T method, absorption of dyestuff takes place to quite a large extent at temperatures below the boil. This allows the dyer to exercise temperature control.

2) With the cationic-retarder system, control is largely dependent on the amount of retarder used, and most of the dyeing takes place over a very narrow temperature range close to the boil, where temperature control is quite difficult.

3) It should be noted that, although by the I-T method certain dyeing takes place below the boil, this must not be interpreted as meaning that is is recommended to dye below the boil. High temperature is necessary if ultimate fastness is to be obtained.

4) By the I-T method, dyes of quite different drawing rates dye at approximately the same rate. The explanation of this phenomenon we believe to be rather simple; namely that the rate of drawing is no longer wholely dependent on the inherent characteristics of the dyestuffs. Instead it is more dependent on the rate of drawing of the cationic/anionic complexes, and the rate of dissociation of these complexes. The net result is that the dyestuffs draw together.

5) The anionic retarding agent remains active in the bath throughout the dyeing cycle. When making additions of dyestuff, it is therefore unnecessary to add more retarding agent to the system.

6) The I-T retarder system permits the use of disperse dyestuffs for small shading additions.

FASTNESS PROPERTIES ——— The newer basic dyestuffs for acrylic fibers have what would be termed superior fastness. These properties are fully retained when the I-T system is used.

Figures 9 and 10 illustrate the comparative light-, wash- and crockfastness of two well-known cationic dyestuffs on Orlon 42, when dyed by the I-T method and a cationic retarder system respectively.

It is obvious that no differences exist in fastness properties when dyeing is carried out by either the I-T method or the cationic retarder method.

Although the foregoing work has been carried out on Orlon 42, it could have been equally well demonstrated on Acrilan 16. It is believed that the I-T approach has certain advantages for other acrylic fibers, which are dyeable with basic dyestuffs. However, this work is still in the laboratory/plant experimental stage, and does not warrant notice at this moment.

ONE-BATH DYEING OF BLENDS CONTAINING ACRYLIC FIBERS

Another valuable feature of the I-T method is its usefulness in the dyeing of blends containing acrylic fibers.

This part of the subject could well form the basis of a separate discussion, but we will try to cover some of the work carried out in this field.

A few blends of current interest are:

1) Orlon 42/wool
2) Orlon 42/Dacron 54
3) Orlon 42/cellulosic fibers
4) Orlon 42/nylon

It has been common practice to dye many of these blends by two-bath processes. This has lead to rather long dyeing cycles; however, it has been found that the I-T retarding system lends itself to one-bath processing with resultant savings in time and cost.

Each blend presents it own problems; therefore generalization can be misleading. Nevertheless, it can be said that choice of dyestuffs must be limited to those cationic and anionic dyes which are compatible by the I-T method.

A testing technique for dyestuff compatibility has been developed. It has shown that many of the modified basic dyestuffs work well, and that quite a wide choice of dyes is available in the acid, disperse and direct ranges.

ORLON 42/WOOL ——— In approaching this blend, it was decided to aim for dyeings of 40 hours lightfastness, and fastness to AATCC Wash Test II.

Figure 11 illustrates the type of dyeing which can be produced on Orlon 42/wool by the I-T one-bath technique.

The method of dyeing is as previously outlined, with Irgasol DA, Tinegal NA, sodium acetate and acetic acid. The wool dyestuffs are added, and the temperature raised to 180°F. The basic dyestuffs are then added, the temperature brought slowly to the boil, and a normal dyeing cycle of one to one-and-one-half hours completed.

GENERAL RUNNING PROCEDURE

20:1 Liquor ratio
0.5-2.0% Irgasol DA
2.0% Tinegal NA
0.3% Sodium acetate
Acetic acid to give pH 6.5
Pretreat at 120°F for 15 minutes.
Add selected wool dyes dissolved in boiling water.
Raise temperature slowly to 180°F.
Add acetic acid to adjust pH to 4.5.
Add basic dyestuffs pasted in a small quantity of acetic acid and dissolved with boiling water. (Do not use live steam).
Raise temperature slowly to 190°F.
Run for 15 minutes
Raise slowly to boil and run one hour.

Additions of dyestuffs for shading purposes are made in a normal manner by dropping the temperature to 180°F, and adding at a five-minute interval the previously dissolved basic and acid dyes.

Selection of Wool Dyes. Wool dyestuffs should be selected not only for their compatibility with modified basic dyes, but also for their level dyeing properties under the existing pH conditions.

Neutral metal complex dyes should be chosen with great care, as many of these dyes form tightly bonded complexes with cationic dyestuffs. These complexes do not dissociate on boiling, the result being precipitation and uneveness.

Even by the I-T process, two of the older basic dyes are dangerous in the presence of acid dyes; namely, CI Basic Red 1 and CI Basic Blue 6. However, when we have taken into consideration these few dyestuffs which can cause trouble, we find a large selection of dyes which work perfectly. (See Table I).

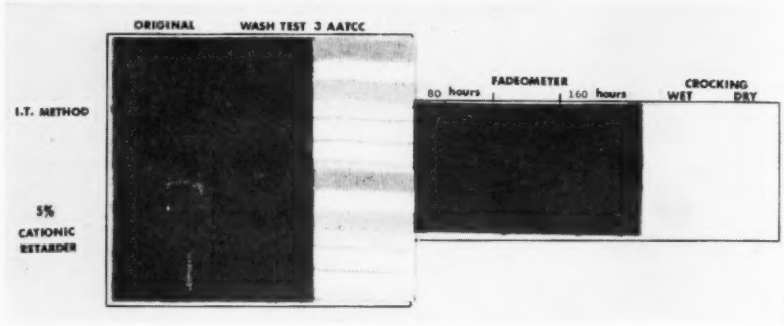

Figure 9
Comparison of wash-, light-, and crockfastness of 0.75% Maxilon Red BL on Orlon 42 when dyed by the I-T method and a cationic retarder system

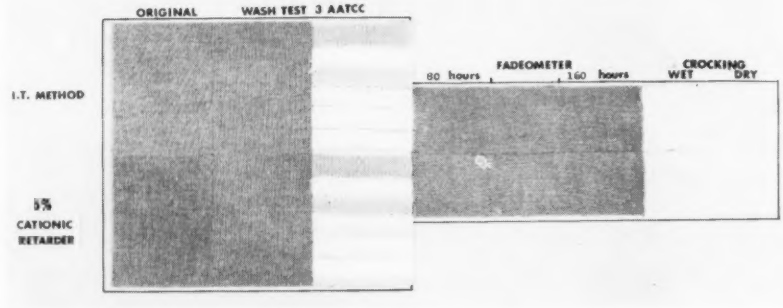

Figure 10
Comparison of wash-, light-, and crockfastness of 1.6% Maxilon Blue GLA on Orlon 42 when dyed by I-T method and a cationic retarder system

TABLE I
Wool dyes recommended for use with the I-T process

CI Acid Yellow 40
Irganol Yellow 3GLS
Irganol Orange GRLS
CI Acid Red 57
CI Acid Red 80
CI Acid Red 168
CI Acid Violet 48
CI Acid Blue 78
Erio Anthracene Brill Blue 2GR (light pale shades)
CI Acid Blue 102 (blues only)
CI Acid Blue 7
CI Acid Blue 80
CI Direct Blue 86 (turquoise fast to light)
CI Acid Green 9 (brightness)
Irganol Green 2GLS

An interesting feature revealed in the I-T one-bath method for Orlon 42/wool is that, in the same manner as the basic dyes are largely dependent on the rate of the complex dissociating for their rate of drawing, so also are the wool dyes.

ORLON 42/DACRON 54———In the dyeing of Orlon 42/Dacron 54, we not only have a cationic/anionic system involved with the cationic dyes, and the anionic dispersing agents in the disperse dyes, but in addition, the picture is further complicated by the presence of carriers, which are emulsified or dispersed with anionic agents.

The I-T method fits perfectly into such a system, as the Irgasol DA retards the basic dyestuffs without affecting the disperse dyestuffs or carriers.

There is no doubt that the carrier chosen plays an important part in this mechanism, as cross staining varies according to the carrier used. Tanavol has done a good job in this respect, although other carriers, such as Dowicide A or Latyl Carrier A, can be employed.

Figure 12 illustrates the type of cross dye which can be produced on

Orlon 42/Dacron 54 by the I-T one-bath process. The method of dyeing again employs Irgasol DA, Tinegal NA, sodium acetate and acetic acid. The carrier used is Tanavol. The disperse dyes are added at 120°F, and the temperature raised to 180°F. The basic dyes are added and the temperature raised slowly to the boil, where the dyeing cycle is completed in 1½ hours.

GENERAL RUNNING PROCEDURE
20:1 Liquor ratio
Set dyebath at 120°F with:
0.5-2.0% Irgasol DA
2.0% Tinegal NA
0.3% sodium acetate
2-5 g/l Tanavol (depending on the depth of shade on Dacron 54)
Run for 15 minutes.
Add %—disperse dyes
Raise slowly to 180°F
Add %—acetic acid to give pH 4.8
Run five minutes at 180°F.
Add %—cationic dyes.
Raise slowly to boil over 30-minute period.
Boil for one to 1.5 hours.

Shading additions are again made in the normal manner by dropping the temperature to 180°F and adding at a five-minute interval the previously dissolved basic dyes and the disperse dyes.

Selection of Dyes. The choice of dyestuffs presents no problem. All of the Maxilon and Setacyl dyestuffs work well, and the same statement undoubtedly applies to other manufacturers' products.

A word of caution is given with respect to dyeing Orlon 42 black and Dacron 54 to a contrasting shade. The older basic dyes, such as CI Basic Green 4, should be avoided, as these dyestuffs cross stain badly. The Orlon 42 should be dyed with a mixture of the new modified basic dyes.

ORLON 42/CELLULOSIC FIBERS——One of the more interesting blends to which the I-T method has been adapted is Orlon 42 in combination with cellulosic fibers. Work has been carried out on mixtures with rayon, cotton and Corval.

Although not as much practical experience is available with this type of blend as with Orlon 42/wool, up to the present time all of the bulk trials have met with success.

A great deal of laboratory work has been necessary in order to determine which direct dyestuffs are suitable. This work has revealed that a good choice of dyestuffs is available, but most emphatically, the selection of direct dyestuffs is very important.

Figure 13 illustrates the type of cross dye that is possible on Orlon 42/spun rayon by the I-T one-bath process. The dyeing method again employs Irgasol DA, Tinegal NA, and sodium acetate. In this instance, monosodium phosphate is used to give a pH of 5.5. The selected direct dyestuffs are added at 120°F, the temperature raised slowly to 180°F, and the cationic dyestuffs added. The temperature is then raised slowly to the boil, and boiling continued for a 30-minute period at which point common salt is added to exhaust the direct dyes.

When shading additions are required, the cationic and direct dyes are added separately at 180°F.

GENERAL RUNNING PROCEDURE
20:1 Liquor ratio
0.5-2.0% Irgasol DA
2.0% Tinegal NA
0.3 g/l sodium acetate
Monosodium phosphate to give pH 5.5.
Pretreat for five minutes at 120°F.
Add %—selected direct dyes.
Raise slowly to 180°F.
Add %—selected cationic dyes.
Run for 15 minutes.
Raise slowly to 190°F, run 15 minutes.
Raise slowly to boil and run 30 minutes.
Add required amounts of common salt—in portions.
Run for a further 30 minutes at boil.

Selection of Dyes. When selecting cationic dyestuffs, a choice should be made of those modified basic dyes that exhibit good dyeing characteristics at pH 5.5. Selection of direct dyestuffs is important and no generalization can be made. Only by testing can the correct dyestuffs be determined. Some of the direct dyestuffs which have been found to work satisfactorily are shown in Table II.

TABLE II

CI Direct Yellow 50
CI Direct Yellow 44
CI Direct Yellow 39
CI Direct Yellow 47
CI Direct Orange 72
Diphenyl Orange LF
Diphenyl Fast Orange AR (Pr 628)
CI Direct Red 24
CI Direct Red 80
Solophenyl Rubine RL
CI Direct Violet 48
CI Direct Violet 47
CI Direct Blue 85
Solophenyl Blue 8GL (Pr 720)
CI Direct Blue 106
Solophenyl Green A2GL
CI Direct Brown 103

However, as stated earlier, not as much practical experience is available on this blend, and it is therefore advisable to make laboratory matches before proceeeding to bulk.

ORLON 42/NYLON——Another mixture where the I-T one-bath process has been applied is in blends of Orlon 42/nylon. In this case, the dyer can use cationic dyes in conjunction with either disperse or selected acid dyes. The latter choice will produce dyeings of good wash-fastness.

Figure 14 illustrates the type of cross dye that is possible by the I-T method on Orlon 42/nylon. It can be seen that cross staining is negligible. The method of dyeing is similar for mixtures of cationic and disperse dyes, or cationic and selected acid dyes. The bath is prepared with Irgasol DA, Tinegal NA, sodium acetate and acetic acid. The disperse or selected acid dyes are added at 120°F, and the temperature raised to 160°F. The cationic dyes are then added and the temperature slowly raised to the boil, where dyeing is continued for 1.5 hours. Shading additions are made in a normal manner by dropping the temperature to 180°F and adding at a five-minute interval the cationic and acid/disperse dyestuffs.

GENERAL RUNNING PROCEDURE
ORLON 42/NYLON

A) BASIC/DISPERSE DYES
Liquor Ratio—20:1
Set dyebath at 120°F with:
0.5-2.0% Irgasol DA
2.0% Tinegal NA
0.3% sodium acetate
% acetic acid to give pH 4.8
% disperse dye
Raise temperature to 160°F.
Run 15 minutes.
Add %—cationic dye (previously dissolved).
Raise slowly to 190°F.
Run 15 minutes.
Raise slowly to boil and boil one to 1.5 hours.

B) BASIC/SELECTED ACID DYES
Set dyebath at 120°F with:
0.5-2.0% Irgasol DA
2.0% Tinegal NA
0.3% sodium acetate
% acetic acid to give pH suitable for acid dyes chosen.
Preheat for 15 minutes at 120°F.
Add %—selected acid dyes.
Raise slowly to 160°F.
Run for 15 minutes.
Add %—acetic acid to give pH 4.8 and after five minutes, add % basic dyes.
Raise slowly to 190°F.
Run 15 minutes.
Raise slowly to boil and boil for one to 1.5 hours.

Selection of Dyestuffs. When a mixture of modified basic dyes and disperse dyes is employed by the I-T method, no particular problem exists with respect to compatibility. All of the dyestuffs tested have worked well.

Again, a word of caution with respect to dyeing a black on the Orlon 42 portion of this blend. The dyeing of Orlon 42 black and nylon to a contrasting shade is more easily accomplished when the nylon is dyed with disperse dyes. If acid dyes are used on the nylon, then selected cationic dyes must be used on the Orlon 42. Such colors as CI Basic Green 4 and Fuchsine should be avoided.

The choice of acid dyes is made on the same basis as for Orlon/wool. However, it is better to choose those dyestuffs which are also known to cover barré on nylon. (See Table III).

TABLE III

Polar Yellow 5G Conc (similar to CI Acid Yellow 40)
Neutral Fast Orange G Conc 167%
CI Acid Orange 45 Conc
CI Acid Red 73
CI Acid Red 57
CI Acid Red 4 Conc
CI Acid Red 99 125%
CI Acid Red 119
Erio Fast Violet LN Conc
Erio Anthracene Brill Blue 3G Extra
CI Acid Blue 78
CI Acid Blue 113
CI Acid Green 25
Polar Brown 2GL
CI Acid Black 48

CONCLUSION

In conclusion, it can be said that the I-T method has a definite application for such fibers as Orlon 42 and Acrilan 16, both as 100% fiber and when blended with other fibers.

With respect to the dyeing of blends, this paper has merely touched on the general dyeing procedures. Time has not permitted covering the intimate details pertaining to the various blends. However, there is no doubt that the I-T method has wide application for one-bath dyeing processes, where cationic dyestuffs are used in conjunction with anionic dyestuffs.

The I-T process for applying cationic dyes to acrylic fibers has been in wide use for quite some time. As a method of dyeing, it has long passed the laboratory experimental stage, and it has met with success not only in the United States, but in Europe and Australia.

ACKNOWLEDGMENT

Finally, I would like to thank the many people in the Geigy organization whose work has made this paper possible.

AATCC Committee on Dimensional Changes in Textile Fabrics (RA42)——

RELAXATION AND FELTING SHRINKAGE OF WOVEN OR KNITTED WOOL TEXTILES

EDWARD ARTIM

Chairman, Committee RA42

COMMITTEE RA42
DIMENSIONAL CHANGES IN TEXTILE FABRICS

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R V Zerbe

*Immediate past chairman (1957-9)

Committee RA42, making necessary revisions, has combined AATCC Tentative Test Methods 73-1953 (Shrinkage of Wool Hose: Accelerated Test), 74-1953 (Relaxation and Felting Shrinkage of Wool Knit Fabrics: Accelerated Test) and 41-1952 (Dimensional Changes in Wool Textiles: Accelerated Test) into one test method.

RELAXATION AND FELTING SHRINKAGE OF WOVEN OF KNITTED WOOL TEXTILES

Tentative Test Method

99-1960

PURPOSE AND SCOPE—— This method is an accelerated test for determining the relaxation and felting shrinkage of woven and knitted textiles containing at least 50% wool which has been treated to render the wool shrink-resistant.

PRINCIPLE —— Relaxation shrinkage is determined by soaking measured specimens in a sesquicarbonate solution, hydroextracting, drying and remeasuring.

Felting shrinkage is determined by washing measured specimens in a soap, polyphosphate, borax solution; or a soap, polyphosphate, sesquicarbonate solution in a rotary washer of the reversing type, rinsing, hydroextracting, drying, measuring.

APPARATUS AND MATERIAL

Washing machine, cylindrical wash wheel of the reversing type (*1*).

Flat-bed press (*2*).

Hydroextractor (*3*).

Mechanical marking device (18″) (*4*).

Scheifer sock-measuring machine (*5*).

Soap, neutral chip, (*6*).

Polyphosphate, sodium (*7*).

Screen-drying racks.

Ruler, 1/10″ scale.

TEST SPECIMENS —— Specimens are allowed to reach moisture equilibrium with a standard atmosphere of 65 ± 2 % rh and 70 ± 2°F (21 ± 1°C) and then laid out without tension on a flat, polished surface, care being taken that the fabric is free from wrinkles or creases. Fabrics that are badly distorted in their unlaundered state due to faulty finishing may give deceptive dimensional-change results when laundered by any procedure. This also holds true if restorative forces are applied. Therefore, it is recommended that in such cases the sample be replaced, or if used, the results of dimensional change or dimensional restorability tests be considered as indicative only.

Hose. The specimen is one sock. Make the shrinkage measurement on a Scheifer sock-measuring device. Place the conditioned sock over the metal form, align the heel gore by moving the pivoting clamp to the position governed by the limiting stop and tighten the clamp. Align the toe gore with the center of the toe form and draw the sock back smoothly. Press the pin on the indicator through the sock and the small hole in the top of the toe form and slowly apply the force of the weight to the sock. Using a tension of five pounds read

the sock size directly from the pin indicator against the scale.

Woven Fabric. The specimens taken for the test should be at least 20" square. Lay out the conditioned specimen on a flat surface without tension, care being taken that the cloth is smooth and free of creases and wrinkles. Mark off three distances of 18" on the specimen in both the warp and filling direction by a suitable marking device. The distances should be parallel to the warp or filling threads, at least six inches apart and at least one inch from all edges of the specimen.

Knitted Fabric. The specimen of fabric taken should be at least 12" square and when available, 15" square should be used for open flat-knit goods or 18" long by the tubular width for tubular goods.

For fabrics which will run or ladder, it is suggested that the edges be sewn with stitch type 505 (*8*).

Lay the conditioned specimen on a flat surface without tension, wrinkles or creases. Mark off three 10" distances on the test specimen parallel to both the wales and courses directions approximately five inches apart and at least one inch from all edges of the specimen. Satisfactory marks may be made with indelible ink and a fine pointed pen, with tubes of textile marking ink or by sewing fine threads into the cloth.

PROCEDURE FOR DETERMINING RELAXATION SHRINKAGE—

Soaking. Fill the wash wheel with water at 100°F (38°C) and containing three grams per liter of sodium sesquicarbonate (8% on weight of material at a 25:1 liquor ratio).

Submerge the marked-and-measured or measured specimens in the above solution and allow to soak for at least two hours (overnight, if more convenient). The water temperature may be allowed to come to room temperature during the soaking period. In the case of socks, the weight of fresh sock specimens should not exceed one pound.

Remove the wet specimens in a ball from the machine with as little distortion as possible and hydroextract by centrifuging for 10 seconds at full speed.

Drying—Woven Fabrics. Press woven fabrics using the flat-bed press at a temperature of 275 to 300°F (135 to 149°C) after laying out the specimens gently on the buck of the press without stretching or distorting.

TABLE I

Test	Water level (inches)	Load (lbs)	Temp (mins)	Suds time (mins)	First rinse Time (mins)	First rinse Temp (°F)	Second rinse Time (mins)	Second rinse Temp (°F)	Total time (mins)
I	2	5 (socks)	140	60	10	120	5	100	75
IA	2	5 (socks)	140	120	10	120	5	100	135
II	7	3 (fabric)	100	15	10	100	5	100	30
III	7	3 (fabric)	100	30	10	100	5	100	45
IV	7	3 (fabric)	100	75	10	100	5	100	90

Drying—Knitted Fabric and Hose. Screen-dry in the air or in an oven with a maximum temperature of 180°F (82°C).

Measuring. Remeasure the specimens after conditioning them from the dry side in a standard atmosphere for at least four hours or overnight.

Measuring Hose. Again, measure the conditioned sock, as before, on a Scheifer sock-measuring device.

After the final rinse, remove the wet specimens in a ball form with as little distortion as possible and hydro-extract by centrifuging for 10 seconds at full speed.

Drying. Dry the item as noted under the Relaxation Procedure.

Measuring. Condition and measure as noted under the Relaxation Procedure. The average of the measurements is expressed as percent total

$$\frac{\text{original measurement} - \text{measurement after relaxation}}{\text{original measurement}} = \text{relaxation shrinkage}$$

Measuring Woven and Knitted Fabrics. Smooth out any wrinkles or creases and measure the conditioned specimen on a smooth surface to the nearest 0.5%. The average of the three measurements in each direction is expressed as percent relaxation shrinkage.

PROCEDURE FOR DETERMINING FELTING SHRINKAGE———

Washing. Place the specimens to be tested and such additional ballast as may be needed to make up the required load in the wash wheel. Add sufficient water at the specified temperature to give the required water level for the sudsing operation. Then add 30 ml of a 30% (by weight) solution of polyphosphate, 170 grams of borax or sodium sesquicarbonate, and sufficient soap so that a one-inch head of suds is produced and maintained during the entire wash. The particular specimen is washed as specified below:

Items (See Table I)

Socks containing 80% or more of wool—Test No. I

Socks containing less than 80% wool—Test No. IA

Sweaters—Test No. II

Knitted underwear and outerwear —Test No. III

Woven fabric—Test No. IV

The machine is stopped, drained and refilled between the wash and rinses.

A seven-inch water level should be used for all rinses.

shrinkage. The percentage felting shrinkage is obtained by subtracting the percent relaxation shrinkage from the total shrinkage.

REPORTING——— Report separately to the nearest one-half percent the shrinkage of both the warp and filling or the length and width (in the case of socks, the length of the foot) and specify the test used by giving the Roman numeral identifying the washing procedure.

NOTES———

(1) Washing machines of this type may be obtained from American Laundry Machine Co, Cincinnati, O; Robert Ewing & Sons Co, Green Island, NY; or Smith, Drum Div, Turbo Machine Co, Lansdale, Pa; or Hurley Machine Co, 22nd St & 54th Ave, Chicago, Ill. (See description of this equipment under Tentative Test Method 96-1960, page 52 of this issue of *American Dyestuff Reporter*.

(2) Pressing equipment of this type may be obtained from: Pantex Co, Pawtucket, RI (flat-bed press, Model FPR-60); Prosperity Co, Syracuse, NY (flat-bed press, Model 160 PC); or United States Testing Co, Inc, 1415 Park Ave, Hoboken, NJ (flat-plate press, Model 6584). (See description of this equipment under Tentative Test Method 96-1960, page 52 of this issue of *American Dyestuff Reporter*).

(3) Extracting machines of this type may be obtained from Bock Laundry Machine Co, Toledo, O (Model 24 BC) or American Laundry Machine Co, Cincinnati, O. (See description of this equipment under Tentative Test Method 96-1960, page 52 of this issue of *American Dyestuff Reporter*).

(4) A mechanical marking device and a measuring tape, calibrated directly in percent shrinkage, may be obtained from Sanforized Div, Cluett, Peabody & Co, Inc, Troy, NY.

(5) The Scheifer sock-measuring device may be obtained from Sherman W Frazier, 955 15th St, SE, Washington, DC.

(6) A stock solution of the soap (Fed Spec P-S-566 or ASTM D496—sodium oleate) may be prepared by dissolving one pound of chip soap in one gallon of hot water. When cooled, this forms a thick homogeneous jelly which may be used as required.

(7) Polyphosphate—Calgon, Quadrofos or tripolyphosphate may be used.

(8) See "Federal Specifications for Stitches; Seams; and Stitching," obtainable from Supt of Documents, Washington 25, DC, for 25 cents.

ACTIVITIES OF THE LOCAL SECTIONS

Western New England

WESTERN NEW ENGLAND SECTION met March 11 at Rapp's Restaurant, Shelton, Conn, following postponement of the January 15th meeting because of inclement weather.

Speaker at the March 11th meeting was Walter Hindle, consultant to the Air Reduction Co, who spoke on "Polyvinyl Alcohol Fibers" and conducted a lively question-and-answer period after the presentation. From Mr Hindle's remarks, it was apparent that the Japanese are appreciably ahead of the rest of the world in the commercial development of this fiber and its uses.

During the business session, the resignation of the WNE Section's secretary, Henry C Speel, was accepted, and William Espelin was appointed acting secretary pending election this month. The following committee chairmen were appointed by Chairman Albert Rant: *Membership*—John E Hirn Jr; *Publicity*—Lawrence M O'Connell; *Corporate Membership*—William McCann; *Reception*—Arthur Bibeau; *Outing*—James Howse; *Bylaws*—Alexander DeMarco.

Approximately 36 members and guests were present.

* * *

The Western New England Section will hold its annual Ladies Night meeting on May 6 at Rapp's Inn, Ansonia, Conn. The meeting has also been designated Past Chairmen's Night. Former chairmen will be guests of honor, and will be presented with scrolls in appreciation of their efforts in furthering the aims of the Section and the Association. WNE past chairmen are J Edward Lynn, Raymond J Carey, Rudolph C Geering, Arthur B Nyquist, Socrates V Vaniotis, Thomas Gillick Jr, John J Cervini, and Andrew W Goodwin.

The program of entertainment will be headlined by a Barber Shop Quartet. A cocktail hour will precede dinned, following which an orchestra will furnish music for dancing until 1:00 am.

Timothy J Horan, Princeton Knitting Mills Inc, is chairman of the affair.

Rhode Island

APPROXIMATELY 100 members and guests attended the March 25th meeting of the Rhode Island Section, held at the Providence Engineering Society headquarters, Providence, RI.

Speakers of the evening were Carlo G DeMarco, chief, Shrinkage & Water Resistance of Textiles Section, U S Army Quartermaster Research & Engineering Center, Natick, Mass, and Edwin J Grajeck, supervisor of product development, Minnesota Mining & Mfg Co.

C G DeMarco

Mr DeMarco discussed "Quarpel; Its Development—Its Application—Its Performance". Quarpel as developed by the Quartermaster Research & Engineering Center, is a combination of a quaternary salt and a perfluoro compound. Its performance on selected fabrics has proven it to be an efficiently durable rain-resistant finish. A variety of application studies have shown that latitude in perfluoro compound choice is feasible. Through the use of Quarpel, new standards of water-resistance performance for military fabrics have been proposed.

Mr Grajeck, in his paper entitled "Textile Applications of Fluorochemicals", discussed the performance of these chemicals as oil and water repellents on textiles.

The next meeting of the Rhode Island Section will be the annual Student Night, to be held April 29 at Johnson's Hummocks, Providence.

Delaware Valley

DELAWARE VALLEY SECTION will hold its annual Ladies Night meeting on April 22 at the Northeast Shrine Club, Rockledge, Pa. Highlighting the program will be a Fur Fashion Show, sponsored by one of the area's foremost furriers showing the latest creations for spring, summer, and fall. Late evening dancing to one of the top Delaware Valley area orchestras will follow an unusually fine dinner.

Recent meetings of the Delaware Valley Section have featured outstanding presentations.

On January 22, before an audience of 104 members at Kugler's Restaurant, Philadelphia, Walter W Burbank, vice president, Permachem Corp, West Palm Beach, Fla, spoke on "Total Environmental Control".

DELAWARE VALLEY SECTION MEETING OF JANUARY 22—L to r: Clarence A Seibert, chairman; Walter W Burbank, guest speaker; Thomas H Hart, program chairman

On March 4, 116 members were in attendance at Beck's-on-the-Boulevard, Philadelphia, to hear Genevieve M Smith, manager, New York Textile Laboratory, Sears Roebuck and Co, and Thomas J Cronin, Quaker Chemical Products Corp, Conshohocken, Pa, discuss two aspects of the "wash-and-wear" situation. Miss Smith spoke on "'Wash-and-Wear' as the Consumer Views It". Mr Cronin's talk was entitled "'Wash-and-Wear' Finishing of Cellulosic Fabrics".

DELAWARE VALLEY SECTION OFFICIALS - 1960—Seated, l to r: E W Empting, secretary; C A Seibert, chairman; E G Haack, vice chairman; C N Kuzma Jr, treasurer. Standing, l to r: D W Robinson, Councilor; F A Mather, publicity chairman; T H Hart, Councilor and program chairman; W S Sollenberger, Councilor; J J Murphy, dining chairman and sectional committeeman; M J Reider, Councilor; J E Conway, membership chairman; L K McChesney, Councilor; W W Gleadall, sectional committeeman; A E Raimo, outing chairman

Metropolitan

VICTOR S SALVIN, head, Dye Laboratory, Celanese Corp of America, Charlotte, NC, was the guest speaker at the Metropolitan Section's March 18 meeting at Kohler's Swiss Chalet, Rochelle Park, NJ. Chairman John A Komninos presided at the meeting, which attracted 200 members and guests.

In his paper, entitled "Disperse Dyestuffs", which related structure of disperse dyes to their dyeing properties, Dr Salvin covered the basic theory of dye application, the characterization of disperse dyes, the behavior of disperse dyes with respect to stability in the dyebath, dyeing rate, pile-on, effect of dyebath additives, and the specificity of dyes for acetate and polyester fibers.

The presentation was aimed toward a basic understanding of recently introduced disperse dyes which is necessary for application to newer fibers and blends. Examples and data were made available from original work on synthesis and properties of anthraquinone blues representing structure which is gas fast on acetate and lightfast on polyester fibers and on synthesis and properties of diphenyl amine yellows representing structure of high washfastness on acetate with useful properties on polyester fibers.

Chairman Komninos announced the appointment of Chris W Farrell and Michael F Costello as cochairmen of the Section's Annual Outing and Golf Tournament, which will be held June 17 at the North Jersey Country Club, Wayne Township, NJ.

Mr Komninos announced that the Section's Ladies Night program will be held May 20 at Kohler's Swiss Chalet.

(Photo by Edward Artim)

Victor S Salvin, speaker at Metropolitan Section's March 18 meeting

(Photo by P J Fynn)

Thomas E Croxson, The Chemstrand Corp, Decatur, Ala, spoke on "The Dyeing of Acrilan/Acrilan 16 Blends" at the February 19 meeting of the Metropolitan Section. (See page 48 of March 21 issue).

Northern New England

THAT the eye is easily fooled by color was dramatically demonstrated by O C Holland, director of advertising for Interchemical Corp's Printing Ink Division, before members and guests of the Northern New England Section at a dinner meeting held on March 18 at the Colonial Country Club, Lynnfield, Mass.

Mr Holland's talk, "The Magic of Color" was well staged and his points forcefully illustrated with a multitude of props and gadgets which the more than one hundred assembled members and guests found informative, interesting and amusing. How a person sees color can be affected by his mood, and how color in turn can influence a person's emotional state was one of the interesting points developed by Mr Holland. He further illustrated the influence of available light source, texture of materials, and the background against which a color is viewed in judging, matching, or combining colors in order to achieve the most pleasing, the most dramatic, or the best visible effects.

The meeting was conducted by Chairman Robert D Robinson, Bachmann Uxbridge Worsted Co, who introduced the newly elected officers.

The next meeting of the Section will be held jointly with the Lowell Technological Institute Student Chapter on May 13 at Lowell, Mass.

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Niagara Frontier

J A LEDDY, manager of synthetics dyeing, Geigy Chemical Corporation, Ardsley, NY, was guest speaker at the annual joint meeting of the Canadian Association of Textile Colourists and Chemists (Ontario Section) and the Niagara Frontier Section, AATCC, which was held in the Queensway Hotel, St Catherines, Ont on March 4.

Mr Leddy's subject was "Dyeing Blends Containing New Chemical Fibers".

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Washington

WASHINGTON SECTION will hold its final meeting of the season on April 22 at the Occidental Restaurant, Washington, DC. Speaker of the evening will be Robert G Levitch, Southern Div, James Lees and Sons Co, who will discuss "Covered Bridges and Carpet Fibers".

Membership Applications

March 17-23, 1960

NEW ENGLAND REGION
Western New England Section

Senior

Henry J DeMarco—Vice pres, Shelton Hosiery Co, Shelton, Conn. Sponsors: A H DeMarco, A H Rant.

Arthur R Merritt Jr—District mgr, sales, Chem Div, Goodyear Tire & Rubber Co, East Hartford, Conn. Sponsors: T J Horan, A W Goodwin.

CENTRAL ATLANTIC REGION
Metropolitan Section

Senior

Wassily Davidiuk—Plant chem, Eureka Printing Co, Clifton, NJ. Sponsors: A A Caddell, E Burke.

Associate

Walter R Coleman—Salesman, Refined Products Co, Lyndhurst, NJ.

Transfer to Senior

Niels P Jensen—Salesman, Verona Dyestuffs Div, Verona Pharma Chem Corp, Haverford, Pa. Sponsors: E Empting, R E Hill.

Delaware Valley Section

Senior

Robert M Bell—Vice pres, sales mgr, Klauder Weldon Giles Mach Co, Philadelphia, Pa. Sponsors: T H Hart, P Theel.

SOUTHERN REGION
Piedmont Section

Senior

Harold S Atwood—Supv tech service dept, Virginia Smelting Co, West Norfolk, Va. Sponsors: W F Pond, P J Wood.

Larkin B Brown—Overseer dyeing, J P Stevens Co, Roanoke Rapids, NC. Sponsors: D A Torrence Jr, W F Hargrove.

Richard B Kelly—Plant mgr, High Point Chem Co, High Point, NC. Sponsors: L W Stevens, J K Honeycutt.

William J Morton—Sales rep, Althouse Chem Co Inc, Reading, Pa. Sponsors: E W Kent, H C Gift.

Junior

William Spier Jr—Sales rep, Atlas Powder Co, Wilmington, Del. Sponsors: R A Olney, R M Bateman.

Associate

Eddie L Johnson—Lab tech, Abbeville Mills Corp, Abbeville, SC.

Vernon M Shell Jr—Advertising mgr, Wica Chem Inc, Charlotte, NC.

WESTERN REGION
Pacific Southwest Section

Senior

Walter J Stocker—Technician, Ciba Co Inc, Los Angeles, Calif. Sponsors: R C Demuth, L F Olsen.

STUDENT CHAPTER
Lowell Technological Institute

Wen Jin Cheng—Student, Lowell Technological Institute, Lowell, Mass. Sponsor: G Griffin.

NON-AFFILIATED

Senior

Hung Ting Chang—Managing dir, Textile Engineering (Far East) Ltd, Hong Kong. Sponsors: G J Mandikos, L Fusser.

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March 24-30, 1960

NEW ENGLAND REGION
Rhode Island Section

Senior

Keith Kenyon—Supt dyeing & finishing, Sterling Pile Fabric Corp, Fall River, Mass. Sponsors: R H Gavitt, F Grant.

Western New England Section

Transfer to Senior

Stuart A Warshaw—Vice pres, gen sales mgr, Berkshire Color & Chem Corp, Springfield, Mass. Sponsors: F Warshaw, S N Markowitz.

CENTRAL ATLANTIC REGION
Metropolitan Section

Senior

James T McGrath—Group leader, physical testing, American Cyanamid Co, Bound Brook, NJ. Sponsors: R J G Schofield, G M Randolph.

Hudson Mohawk Section

Associate

Thomas F Connell—Vice pres, gen mgr, Palatine Dyeing Co Inc, St Johnsville, NY.

SOUTHERN REGION
Piedmont Section

Senior

E Grady Hines—Chemist, Elmore Corp, Spindale, NC. Sponsors: N A Truslow, J H Emerson.

James C Pangle Jr—Chemist, Dan River Mills, Danville, Va. Sponsors: R L Wayland Jr, C L Zimmerman.

Associate

Frederick D Hoff—Chem salesman, Celanese Chem Co, Charlotte, NC.

Southeastern Section

Senior

Thomas R Sutterfield—Foreman of preparation dept, Eagle & Phenix Div, Reeves Bros, Columbus, Ga. Sponsors: L Tigler, H J Gambert.

WESTERN REGION
Mid-West Section

Senior

Charles F Dudley—Chemist, Dow Corning Corp, Midland, Mich. Sponsors: F L Dennett, E M Eddington.

NON-AFFILIATED

Senior

Jaime B Newell—Tech salesman, Rohm & Haas Co (USA), Lima, Peru. Sponsors: G R Thompson, G J Mandikos.

STUDENT CHAPTER
New Bedford Institute of Technology

Dinesh V Radia—Graduate student, New Bedford Institute of Technology, New Bedford, Mass. Sponsor: F Tripp.

Bipinchandra R Shukla—Graduate student, New Bedford Institute of Technology, New Bedford, Mass. Sponsor: F Tripp.

PROGRESS REPORT–AATCC MEMBERSHIP DRIVE COMPETITION

Group I	*Membership Drive Competitive Status*	*Sept 1, 1959— Senior, Junior, Assoc Members*	*New Memberships 9/2/59—3/23/60*	*Percent Increase*
Section				
Washington	First	119	18	15.13
South Central	Second	218	18	8.26
Western New England	Third	166	13	7.83
Pacific Southwest	Fourth	130	9	6.92
Niagara Frontier	Fifth	103	5	4.85
Hudson Mohawk	Sixth	167	4	2.40
Pacific Northwest	Seventh	47	1	2.13
Group II				
Piedmont	First	1186	72	6.07
Mid-West	Second	396	23	5.81
Delaware Valley	Third	813	35	4.31
Metropolitan	Fourth	1422	61	4.29
Southeastern	Fifth	421	16	3.80
Northern New England	Sixth	475	17	3.58
Rhode Island	Seventh	593	19	3.205

APRIL ARIA
1960

Inter Alia—Inter Nos

P J WOOD

TRAVEL

The elevating and cultural influence of travel has been expatiated upon by so many writers that it will suffice to no more than mention it here.

The chief restraining factor in the way of most individuals, in the past, has been the cost of travelling; not only the expenses of transportation by sea or air, but the disbursements for food and lodging have been considerable. Many years ago the steamship companies offered some relief to those of moderate means who wished to indulge in this delightful form of recreation; they established a new class of accommodations which had two features that appealed to the would-be globe-trotters; the fare was cheaper and dressing for dinner was no longer required. The first saved the pocket book and the second reduced the amount of baggage necessary. The "Tourist Class" met with immediate acceptance; so much so, that tourist class ships became not uncommon.

When we were at school, a popular type of holiday was a bicycle trip through France, Belgium or Germany, sleeping nights in small but invariably clean, economically priced hotels. Another variation was a canoe trip through the Belgian canal system or a journey up the Rhine and back on one of those small river steamships that regularly plied that interesting and picturesque waterway. Still another was sailing the Norfolk "Broads" in East Anglia, which was all right too, unless the wind gave out. Here it was customary to hire a man to do the navigating and the cooking, which expense, divided between four or five boys or men, was not burdensome.

Since those days of long, long ago, the economic status of almost everybody has taken a turn for the better, so that European travel has become more common. To some extent this attitude toward this type of vacation has been stimulated by the many members of Uncle Sam's army and navy who have had a trip free, gratis and for nothing at the said Uncle's expense. They are grown up now and like to take their wives and families and revisit the "glimpses of the moon".

Although fares have gradually been increased with the passage of time and while the innkeepers in those foreign countries have become more sophisticated, and these charges have more or less kept pace with the higher economic level of the American people, there are still some ways in which the high cost of living can be assuaged. Take, for instance, the matter of air transport; only a few days ago we received an invitation to take advantage of a special rate offered to the members of the NY and Northern NJ sections of ACS. This is to take place before the great rush of tourists in the popular periods of travel: but it is a big saving.

Then, the matter of cheaper accommodations, once over there, is solved by the current "Insider's Newsletter" in a few trenchant paragraphs, the first of them bearing the title "On Living Like Kings". In this part of the revelation is described the possibility of living as a paying guest in a castle in Austria, Italy and Germany "for as little as $6 a day". Think of it! This startling paragraph goes on to tell of Castello San Giorgio on the Riviera outside of Spezia, which has been turned into a hostel for students at 50¢ a night. Here they sleep in dormitories and cook their own meals in the giant stone kitchen.

Let's go.

BOOK OF THE MONTH - MUSICAL RECORD OF THE MONTH - ETC

In the very next paragraph in "Insider's Newsletter" is an eye-opener of an item. From it we learn that it is now possible to subscribe to a Cheese-of-the-Month Club. Says the Newsletter in this story, which they call "On Dining Like Queens".... "they will mail you or a friend, Italian Provolone in April, Norwegian Nokkelost in May and so on throughout the year".

At home we have an encyclopedia which seems to cover almost everything in human experience; in it is a list of several hundred cheeses from all parts of this world, arranged alphabetically running from A to Zed. It starts with Abertan from Czechoslovakia and ends with Zomma from Turkey. So the originators of this gorgeous idea will have no difficulty in supplying their clientele with a different cheese every month in every year for years to come.

This scheme should prove a boon to all cheese addicts, who, like this present scribe hie them to the giant supply store where they display so many varieties of this toothsome delicacy that it is easy to fall into the error of buying too many and too much of each; they accumulate so rapidly that our partner donates them to our cleaning woman every so many weeks or so, which may be why she has been coming to our house these thirty years or more, also why she appears to weigh a hefty 250 lbs (estimated).

HERE & THERE

If E J Davies hadn't been so much interested in the conversation he was carrying on with Miss Esmee Smith, the clever chemist daughter of our old and respected friend Fred Smith, of happy memory, the world would have a better idea of what he looks like. They were both in a picture with R Heaton and R Rankin, chairman and vice ditto of the West Riding Section of SDC, before which august body "Gus" Davies had just delivered a lecture on "The Appearance of Textile Faults in Drycleaning". Memo: We must remember to write Gus for a reprint of that paper which will be useful and interesting to Al Johnson and other expert drycleaners we know. Photo was in our favorite English textile coloring journal, the "Dyer".

The largest flasks we had at Leeds were of four-liter capacity. Someone bet Charlie Fowler a shilling that he could not down one of these full of water before quitting time (about 2-1/2 hrs away); Charlie, being the son of an Episcopal clergyman (boys of this origin are alleged to be rather on the daring side) took the bet. When 5 o'clock struck, Charlie was all but foundered, but he won the 1/-coin of the realm. Our recollection is that Charlie had to get his distended paunch swaying in the correct rhythm before starting to walk forward. We wonder what would have happened if the laboratory had had some of these modern flasks, about which we just read in the "Dyer", that have a capacity of 200 liters. Seven of them have just been sent to India, we hear.

Dick Jones dropped into our office on March 16 for a chat. Just in the nick of time we recollected that it was Dick's birthday, and the phenomenon of our good memory is easily explained; we remembered that it was one day before the seventeenth, St Patrick's Day, as we had one time remarked that it was oddly near that historic date and we had concluded it was probably as near to it as anyone with such a Welsh name would ever be allowed to be born. He brought us the good news of his eldest offspring that he had passed his first term exams at Miami University, with mostly A's, only an occasional B and nothing below that. We remember Dick when he was a bachelor, then when he was a blushing (sic) bridegroom and then came Ricky, the hero of this paragraph. Congratulations Ricky! We never had any offspring that could come up to this record; as a matter of fact we never had any offspring full stop.

THE OLD SCHOOL TIE

Those of us who had the good fortune to attend the "get together" organized to spend one noontime lunch with C M Whittaker, at the Tennis & Rackets Club in New York, on the occasion of his last, or maybe we should better say, his most recent visit to this country, will recognize readily the verbal picture someone has drawn of him in the Feb 12th number of the "Dyer". We suspect this might have been done by Gordon W Bednall, the able editor of that world-known journal.

We would like to personally thank the writer for this script on our old class-mate and lifelong friend. When we approached the end of our college career he mentioned that his grandfather had insisted that he spend a year in Germany, "to learn the meaning of the word 'gruendlich'" (thorough, Elmer). He went. He learned it.

THE "KIND-OF-A" DEPARTMENT

The kind of a fellow who, when he was a kid, always brought the teacher an apple.

The consistent type who always goes to church Easter and Christmas, or to the synagogue at Pesach and Yom Kippur - and at no other time.

The kind of a man who, when asked to serve on a committee, asks, either orally or mentally, "What is there in it for me?"

The kind of an individual whose name serves on a multitude of committees.

The kind of a good egg who says, "I don't care what committee you put me on if it is something I can do to help".--QEF

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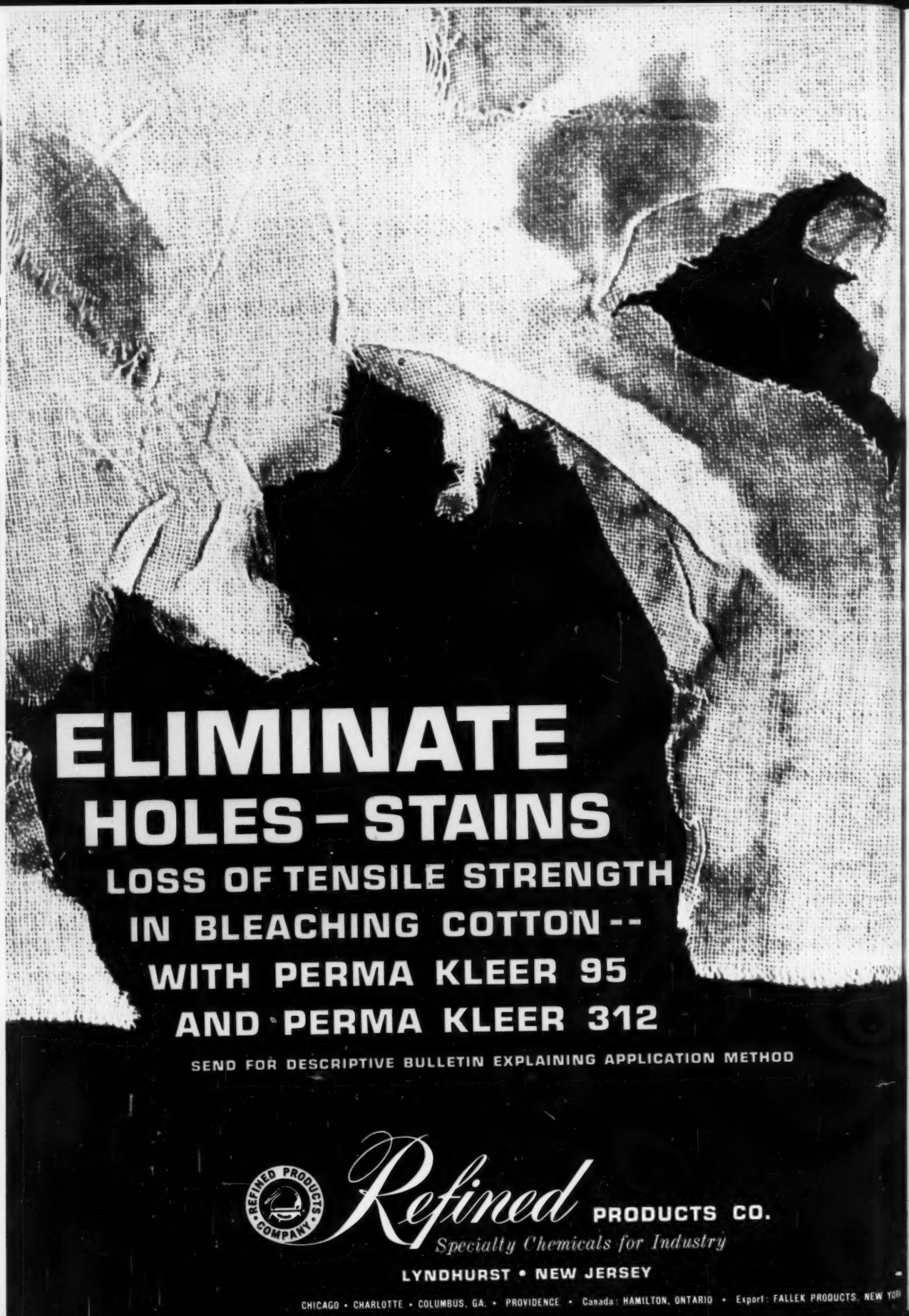
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L-22 Textile Performance Standards Introduced

American Standard L-22 "American Standard Performance Requirements of Textile Fabrics" was introduced at a press conference last month, culminating several years' effort by over 30 textile, retailing and consumer organizations working under American Standards Association procedures. Sponsor of the project is the National Retail Merchants Association. The standard will be published and distributed in June, and the ASA is now accepting prepublication orders. For further information, write to American Standards Association, Dept PR 140, 10 East 40th St, New York 16, NY.

The basic characteristics covered by the standard include shrinkage, colorfastness, and the like. In addition, there are provisions to cover such special characteristics as wrinkle or crease resistance, mildew and rot resistance, and minimum care.

Test methods incorporated in the Standard are primarily those of the American Association of Textile Chemists and Colorists and the American Society for Testing Materials. Also included are test methods of American Viscose Corp, United States Testing Company, Textile Distributors Institute, Federal Specification CCC-T-191b, and Commercial Standard CS 59-44.

AATCC test methods involved are: 8-1957, 14-1953, 15-1957, 16A-1957, 20A-1958, 22-1952, 23-1957, 24-1957, 30-1957, 34-1952, 35-1952, 41-1952, 61-1959, 63-1957, 66-1956, 69-1959, 74-1953, 76-1954, 79-1954, 85-1957, TT 88-1958, 91-1958, and 95-1959.

Stated simply, the new L22 will make it possible, when a woman buys a dress labeled as meeting the requirements of L22, to know that the dress will give certain minimum standards of performance and wear. Or, when she buys new draperies, she can know that when time comes to send them off to the cleaners, the cleaner will know exactly how to handle them for best results.

Provision is included in L22 for certification of items to be labeled and for test methods to be used for evaluation of items under the standard. Special tags will spell out for the consumer proper handling and laundering of every item covered by L22. Special permanent labels will identify it as complying with provisions of the standard.

The new L22 is composed of 75 separate American Standards covering three textile groups. The L22 includes 38 standards in women's and children's wear, 22 in men's and boy's wear and 15 in home furnishings. Included in the women's wear list, for instance, will be end uses for coats and suits, linings, dresses, blouses, bathing suits, gloves, slips, rainwear, etc.

While the L22 standard is voluntary, as are all of the American standards, NRMA is urging its member stores throughout the country to adopt it and to inform their customers about it.

Participating in the press conference which introduced the new L22 standard were: Cameron Baker, Better Fabrics Testing Bureau, Inc, chairman, Technical Committee L22; J Gordon Dakins, executive vice president, NRMA; Cyril Ainsworth, deputy managing director, American Standards Association; Lester O Naylor, vice president, Montgomery Ward & Co, and chairman, L22 Committee; Walter Ross, president, Rosewood Fabrics, Inc, board chairman, Textile Distributors Institute and a vice chairman of the L22 Committee.

Also Jackson E Spears, vice president, Burlington Industries, Inc, and a vice chairman of the L22 Committee; Ephraim Freedman, director, Macy's Bureau of Standards, chairman, NRMA Technical Committee and chairman, ASA Consumer Goods Standards Board; and George G Sommaripa, of ASA, secretary, L22 Committee.

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2500 Attend 34th Annual DCAT Dinner

Over 2,500 representatives attended the 34th Annual Dinner of the Drug, Chemical and Allied Trades Association last month at the Waldorf-Astoria, New York, NY.

Earl W Kintner, chairman of the Federal Trade Commission, gave a provocative address on "Business Citizenship in America".

DCAT President William W Huisking presided at this dinner and William J Schieffelin was general dinner chairman and toastmaster.

Officers of leading associations in the drug, chemical and allied trades throughout the United States were guests of honor and were seated on the dais.

Indian Head Mills Buys USF-Aspinook Finishing

Gera Corporation, which is a subsidiary of Glen-Alden Corporation, and Indian Head Mills, Inc, have entered into an agreement for the purchase of the assets of USF-Aspinook Finishing Division of Gera by a subsidiary of Indian Head Mills, Inc.

The transaction reportedly involved approximately $6,900,000.

The finishing concern will continue to operate under present mangement as the USF-Aspinook Finishing Division of Indian Head Mills, Inc.

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Nopco Acquires Interest in French Chemical Firm

Nopco Chemical Company has announced that its wholly-owned subsidary, Nopco Chimie, SA, Fribourg, Switzerland, has acquired a half interest in the French chemical firm, Doittau-Sopura, SA, Corbeil-Essonnes, outside Paris. Three hundred thousand dollars reportedly were involved in the transaction.

Doittau-Sopura will produce the complete line of Nopco chemicals for distribution in the European Common Market area. The French company will be operated by existing personnel, with M Jacques Combette as president. John E Ward, resident manager of Nopco Chimie, will serve as technical advisor and a director.

The acquisition marks Nopco's continuing expansion into foreign countries and markets. In addition to Doittau and Nopco Chimie, the Newark firm has full ownership of Nopco Chemical-Canada at London, Ontario, and holds a half interest in Nopco Industrial, SA in Mexico City. Nopco also has sales representatives and manufacturing licensees in more than twenty countries throughout Europe, Latin America, and the Far East.

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57th Phi Psi Convention

James Q duPont, a great-great-grandson of the founder of the Du Pont Company, will be the main speaker at the 57th Annual Convention of Phi Psi, national textile fraternity. Speaking at the Hotel Roosevelt, New York, on April 30, at the Annual Banquet culminating the three-day event, Mr duPont's subject will be "Pattern for Success".

Roger A Lewis, Deering-Milliken & Co, is general chairman of the Convention.

Officials are shown breaking soil on the occasion of the start of construction of Putman Chemical Corp's new Southern office, laboratory and warehouse on 16 acres of newly acquired property off bypass 29 in Charlotte, NC.

Holding the golden shovel is J L Wyman, Putman's Southern sales manager. Assisting him, left to right, are W M Ficklen, industrial manager, Chamber of Commerce, Inc, NC; J G Claud, assistant vice president, American Commercial Bank, Charlotte, NC; Beach Hall, Freeman & McClintock (real estate brokers), Charlotte; and L E Moody, vice president and general manager, Putnam Chemical Corp.

Temporary facilities have been set up at 1229 W Morehead St, Charlotte 8, NC.

Program for Conference on Blend Fabrics

J B Goldberg, general chairman of the Conference on Blend Fabrics to be held May 17-18 at the Quartermaster Research & Engineering Command, Natick, Mass, has announced the program for the parley, which is being sponsored by the National Academy of Sciences, National Research Council Advisory Board, QM R & D Committee on Textile Fabrics.

Theme for the day on May 17 will be "Influence Upon Fabric Performance of Blending Textile Fibers". Papers to be presented are as follows:

"Some Effects of Blend on Structure"—M J Coplan, Fabric Research Labs, Inc

"Changes in Mechanical Properties of Fabrics of Cellulosic Fiber Blends"—H Thomas, Courtaulds, Ltd (England)

"Changes in Properties of Wool-Type Fabrics"—L Fourt, Harris Research Laboratories, Inc and C J Monego, QM Research & Eng Command

"Ortho Mixtures"—R Stoll, Celanese Corp of America

"Texturizing and Blending"—J A Lopez, Chemstrand Corp.

Theme for the day on May 18 will be "Impact Upon Fabric Performance of Combining Different Yarns and Fibers". Papers to be presented are as follows:

"Change in Aesthetic Properties by Blending"—J R Bercaw, Du Pont Co

"Impact of Blends on Clothing Manufacture"—E Hirschberg, Hart Schaffner & Marx

"Consumer Reactions"—G Smith, Sears Roebuck & Co

"Application of Blends to Military Uses"—F Rinecker, Aeromedical Laboratory, Wright Air Development Div, Wright Patterson Air Force Base; T J Seary, Bureau of Supplies, U S Dept of the Navy; S J Kennedy, QM Research & Eng Command; and N Sachs, Marine Corps Supply Activity.

The Conference is open to those associated with the textile and allied industries . There is no registration fee. Any inquiries regarding attendance or facilities for transportation from Boston to Natick should be addressed to W George Parks, Univ of Rhode Island, Kingston, RI.

On the day following the "Conference on Blend Fabrics", Thursday, May 19th, the annual celebration of Industry Day will take place at the Quartermaster Research & Engineering Command. This is the annual open house at which the activities of the Quartermaster Research & Engineering Command are displayed to members of industry. All those attending the Conference are encouraged to participate in the Industry Day activities.

PTI 75th Anniversary Ceremonies

James Creese, president, Drexel Institute of Technology, Philadelphia, will be principal speaker at convocation-dedication ceremones climaxing the 75th anniversary of the founding of Philadelphia Textile Institute, and textile education in the United States. The ceremonies will be held in the new $650,000 student union building on the Institute's campus, School House Lane and Henry Avenue on Saturday, April 23 at 2:30 pm.

The two buildings to be dedicated are the seventy-five room Residence Hall for men, and the most recently added student union building. The latter combines a large auditorium and eight student activities rooms, a student lounge, and dining facilities for students, faculty and staff. The Residence Hall, which houses 150 students, was built at a cost of $450,000.

Other buildings comprising the seventeen-acre, $4,000,000 PTI campus include a laboratory and classroom building, constructed in 1949; the Hesslein Library, built in the same year and expanded with a wing in 1957; and the Administration Building.

Philadelphia Textile Institute offers four degree-granting programs —textile engineering, chemistry and dyeing, design, and management and marketing. Plans were recently approved by the College's Board of Trustees to expand the curricula into non-textile majors in business administration, chemistry, and industrial engineering.

This policy change was initiated on the basis of a survey of top textile and allied industry executives, and studies by the Education and Faculty Committees of the College. While textile courses will remain a specialty of the College, they will, in the future, be optional with other academic, science and engineering courses. The curricula changes represent the first major policy revision in the College's 76-year history.

•

Statistical Quality Control Short Course

A statistical quality control short course will be held in the School of Textiles at North Carolina State College May 2-13.

The 10-day course will include the statistical approach to textile quality control as well as practical applications of these techniques to routine quality problems of the textile industry.

15th Purdue Industrial Waste Conference

The 15th Industrial Waste Conference will be held May 3, 4, and 5 at the Purdue Memorial Union Building, Purdue University, Lafayette, Ind. There will be approximately fifty papers presented on subjects dealing with industrial wastes and their treatment.

Registration blanks and/or additional information may be obtained by writing to Prof Don E Bloodgood, School of Civil Engineering, Purdue Univ, Lafayette, Ind.

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2nd Quinquennial Wool Textile Research Conference

The Second Quinquennial Wool Textile Research Conference will be held in Harrogate, England, May 18-28. General theme will be "Fiber Science".

Application forms may be obtained by contacting Gerald Laxer, director of science and technology, The Wool Bureau Inc, 360 Lexington Ave, New York 17, NY.

•

FMC Drops Westvaco Name from Divisional Identification

FMC has dropped the name Westvaco from its Divisional and brand identifications. The former Westvaco Divisions will in future be known as the Chlor-Alkali and Mineral Products Divisions of the Corporation.

Westvaco Chlor-Alkali Division is a major producer of caustic soda, chlorine, soda ash and solvents. Westvaco Mineral Products Division is a fully integrated manufacturer of phosphates, barium products and magnesias. These chemicals and all other products of the two Divisions formerly identified with the Westvaco name will in the future be known as FMC Chemicals.

The change has been made to point up the fact that the Chlor-Alkali and Mineral Products lines are part of the broad family of FMC Chemicals.

•

Althouse Installing Pressurized Dye Units

A new high-pressure and high-temperature research dye unit is now being installed in the Applications Research Laboratory at Althouse Chemical Co, Reading, Pa.

Manufactured by Longclose Ltd of England, the unit is designed for the dyeing of new synthetic yarns in the 235-250°F range.

Inspecting new athraquinone plant at Bound Brook, NJ, President Wilbur G Malcolm of American Cyanamid Co (right) listens attentively as operator John Janek explains panel board control system in multimillion-dollar facility now undergoing shakedown tests. When new unit goes on stream this Spring, Cyanamid will become the largest U S producer of anthraquinone and only U S producer of naphthaquinone. Accompanying Dr Malcolm on the tour were A G Hill (left), Bound Brook plant manager, and W H Bowman general manager of Cyanamid's Organic Chemicals Division, which operates the plant.

New Wash-Wear Finishes to be Sought by USDA in Contract Studies by LTIRF

New finishes to impart improved wrinkle resistance and wash-wear properties to cotton fabrics will be sought by research workers at the Lowell Technological Institute Research Foundation under a contract with the U S Department of Agriculture.

The contract was negotiated for the Department by the Agricultural Research Service's Southern Utilization Research and Development Division, New Orleans, La, and will be supervised for the Division by chemist John G Frick Jr, of the Cotton Chemical Laboratory. Emery I Valko, who received the 1958 Olney Award in recognition of his achievements in textile research, will have charge of the work at the Lowell Technological Institute Research Foundation.

Wash-wear cotton fabrics have been increasing in popularity at a rapid rate since they were first introduced a few years ago, as shown by the increasing volume of sales. A number of wash-wear finishes that give excellent results are not in commercial use. Others still in the laboratory stages show promise of being even more satisfactory. Most of these finishes, however, cause some loss in fabric strength. Workers at Lowell will try to find new finishes that will impart satisfactory wash-wear properties without reducing fabric strength.

The Southern Utilization Research and Development Division is the USDA center for cotton utilization research. It has been active in wash-wear investigations for many years, and at present has an extensive program of research on finishes to produce even better products of this type.

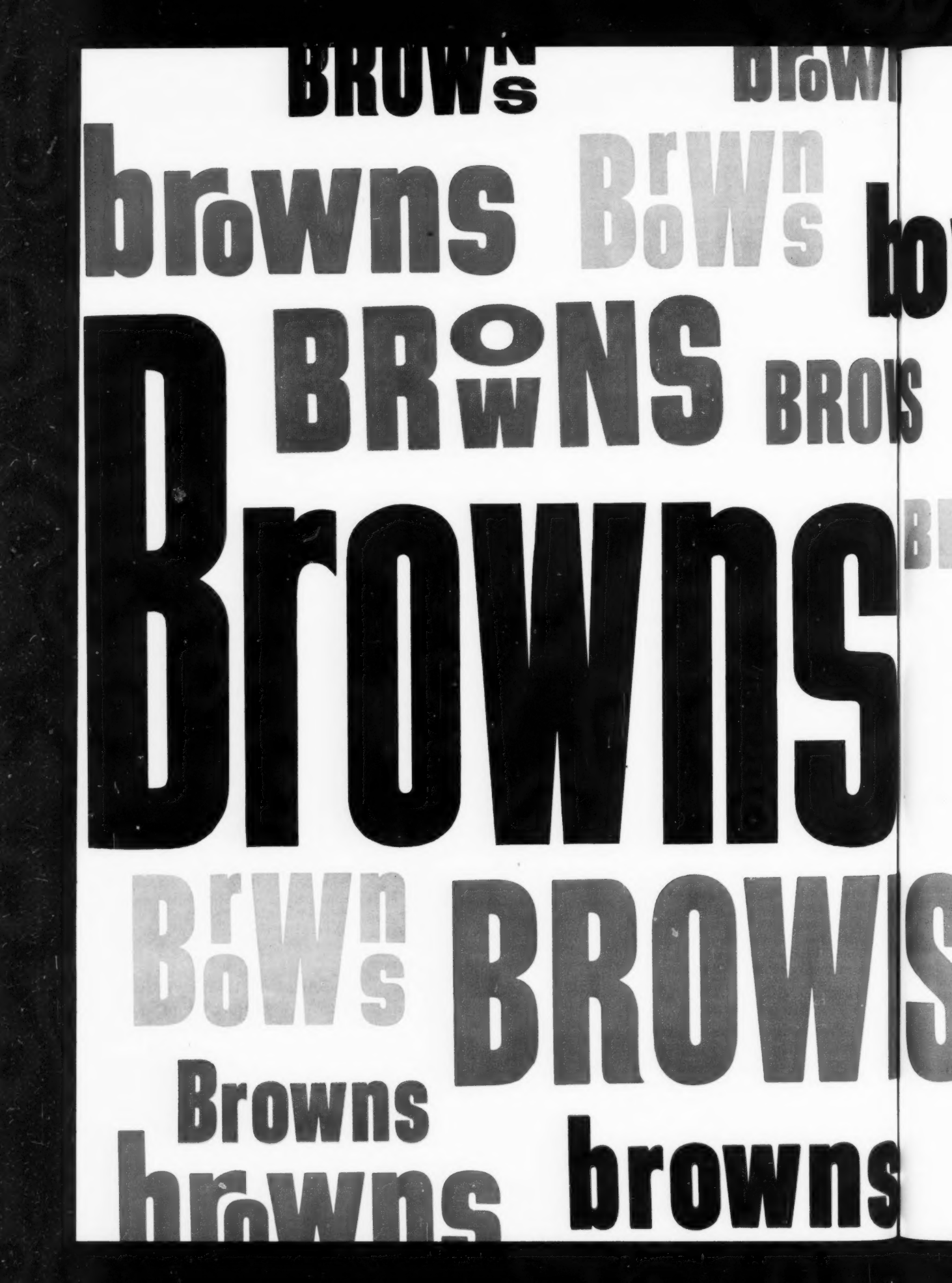
Wash-wear research is part of a broad program conducted at the Southern Division to increase the consumption of cotton and improve its market position through the development of new and improved products and processing methods.

•

GAF's D&C Division Moves Traffic and Purchasing Depts

The Dyestuff and Chemical Division, General Aniline & Film Corp, New York, has announced relocation of both the Traffic and Purchasing Departments from Linden, NJ, to New York, NY.

John B Sondey, traffic manager, and S S Colman, purchasing agent, as well as their staffs, will now be located at the Division's headquartres at 435 Hudson St, New York.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- They're equally advantageous for printing cottons and synthetics, including rayon, acetate, nylon, Orlon, Dacron, Dynel, Arnel, Fiberglas and other fibers and blends.
- They're useful as browns for straight shades . . . in medium and long cuts for neutral tans . . . and in blends with other Aridye or Aquaprint Colors for producing popular rust, melon, and chocolate shades.

The Aridye and Aquaprint Browns now being offered include:

ARIDYE	AQUAPRINT
Brown R	"Supra" Brown R
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• NAMES IN THE NEWS •

Fono

Andrew Fono has been appointed director of research for Otto B May, Inc, Newark, NJ, subsidiary of Cone Mills Corp.

According to Ernest M May, president, this appointment was made in order to widen the scope of May's development efforts in the field of chemistry. Dr Fono is an authority in the field of free radical reactions, important in elastomers and polymers.

Dr Fono returns to Otto B May, Inc from Firestone Tire and Rubber Co, where he was a senior research scientist. Prior to that he was with Otto B May, Inc for five years working in the field of dye chemistry.

•

Charles H Sommer was elected president of Monsanto Chemical Company on March 23 and *Charles Allen Thomas* was elected chairman of the board of directors, succeeding *Edgar M Queeny,* who will continue as a board member, member of the Executive Committee, and chairman of the Finance Committee.

The election occurred at the regular meeting of the board, following the company's 58th Annual Meeting. Thomas had been president, and Sommer chairman of the Executive Committee and a member of the Finance Committee.

•

George J Forrest has been elected president of Banco, Inc, New York, succeeding *Robert E O'Hara,* recently retired. *John J Horan* will replace Mr Forrest as executive vice president of the company, and *William R MacIntyre Jr* has been named vice chairman of the board of directors.

The new president has served Banco in various capacities since joining the company in 1947, following prior service with Joseph Bancroft & Sons Co.

The Banco firm is the soliciting sales representative of Joseph Bancroft & Sons Co, Wilmington, Del, and The Eddystone Manufacturing Co, Eddystone, Pa.

Cooper

Hamilton

Harshaw Chemical Co has announced the appointment of *Charles E Cooper* as assistant to the plant manager, *John A Zelek,* of the Zinsser Division at Hastings-on-the-Hudson, NY.

Roy Hamilton has joined the sales force of Zinsser as assistant to *Harold W Dingee,* divisional manager. Mr Hamilton was most recently associated with Kramer Chemicals, Inc, and prior to that was a technical representative for Interchemical Corp. He will headquarter at the Hastings-on-Hudson plant, which manufactures dyes and textile pigments.

•

Thompson

Harold C Thompson has been appointed branch manager of the New England territory of Geigy Dyestuffs, Division of Geigy Chemical Corp.

Mr Thompson joins Geigy after eight years with Mohasco Industries, where he was manager of dyeing research.

Mr Thompson is located at Geigy Dyesuffs' plant in Newton, Mass, which offers laboratory, custom-mixing and warehousing facilities, servicing leather, paper and textile industries in that territory.

•

M E Klee, president of Intercontinental Chemical Corp, New York, a wholly owned subsidiary of Farbwerke Hoechst AG, Frankfurt-Hoechst, West Germany, has been elected president of the German-American Chamber of Commerce, to succeed *Robert D Merrill,* vice president, American Cable & Radio Corp.

Grant

Appointment of *Troy Grant* as a chemist with the Textile Research and Development Group has been announced by The Hilton-Davis Chemical Company Division, Sterling Drug Inc.

Mr Grant was employed by Hilton-Davis at its regional distribution center and customers' sevice laboratories in Greenville, SC, prior to his present appointment.

•

Werner von Bergen was honored March 3 at the Spring Meeting of ASTM Committee D-13 on Textile Materials, held at the Sheraton Atlantic Hotel, New York. Mr von Bergen was the 11th recipient of the Harold DeWitt Smith Award for outstanding service to the textile industry. The presentation was made by *Benjamin Whittier,* chairman of Committee D-13, after an address by *Griffin Ashcroft,* textile consultant. *Richard T Kropf,* vice president of Belding Heminway Co, Inc, and past president of ASTM, presided at the afternoon session.

Mr Ashcroft, in his address, highlighted the many accomplishments and contributions to the industry by Mr von Bergen, who is now associate director of research with J P Stevens & Co.

Mr von Bergen was previously honored by Committee D-13 and his Subcommittee on Wool Fibers after serving for ten years as chairman of this ASTM group. He was also the recipient of the Olney Medal presented by the American Association of Textile Chemists and Colorists in 1952.

•

Augustine LaTorre has been appointed to the research laboratory staff of Polyvinyl Chemicals, Inc and assigned to the polymer development research group.

He was formerly a member of the laboratory staff of the Dewey & Almy Division of Grace Chemical Co.

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St Louis

Metro-Atlantic, Inc has named *Ernest St Louis* to the position of technical coordinator. Mr St Louis will be located in the Centredale, RI, plant and will be responsible for coordinating the laboratories, production and technical service.

Mr St Louis was formerly vice president and general manager of Valchem. Prior to that he served as technical director of Synthron, Inc, and technical service manager of the Warwick Chemical Co.

•

Arthur S Flemming, U S Secretary of Health, Education and Welfare, and *H E Humphreys Jr*, chairman and chief executive officer of United States Rubber Co, will be principal speakers at the 88th annual meeting of the Manufacturing Chemists' Association.

The meeting is scheduled for June 9-11 at The Greenbrier, White Sulphur Srings, W Va. Secretary Flemming will speak at the annual banquet June 10. Mr Humphreys' address is set for the business meeting, June 9.

Gen John E Hull, USA (Ret), Association president, will speak at the business meeting.

Howard S Bunn, president of Union Carbide Corp, is program chairman for the meeting.

•

James G Baldwin has joined Hooker Chemical Corp as general manager of the Western Chemical Division. He will be responsible to *Thomas F Willers*, vice president.

•

Skeist and Schwarz Laboratories, Inc, New York, NY, recently announced the addition of *Henry J Rynkiewicz* as laboratory director and *Reinhard Eck* as research associate.

Mr Rynkiewicz was formerly with American Cyanamid Co as research specialist in mechano-electrical devices for quality control and automated production systems.

Dr Eck was associated for many years with United Piece Dye Works as manager of resin products and production for textile finishes and pigment printing.

Weisberg

Kroll

Mark Weisberg and *Harry Kroll* have joined forces to act as consultants in the fields of organic synthesis, chelation chemistry, dyestuffs, pharmaceuticals, organic intermediates, surface-active agents, resins, polymers, metal finishes, corrosion inhibition, and textile chemical specialties.

Mr Weisberg has been active in the chemical industry for 40 years. He was the founder and owner of Alrose Chemical Co, which he sold to Geigy Chemical Corp. In 1954 he organized a consulting business, Eltex Chemical Corp. He is the founder of Technic, Inc, Providence. He also was instrumental in the founding of Wymat Chemical Corp, Kearny, NJ, and Hampshire Chemical Corp, Nashua, NH.

Dr Kroll was a research director for Alrose Chemical Co and Geigy Chemical Corp and was section chief of the Physical Chemistry Section at Olin Mathieson Company. For the past three years he has been a consultant to many industrial companies and doing special research work under contract to the Atomic Energy Commission and the National Institute of Health.

Mr Weisberg and Dr Kroll will operate under the name of Eltex Research Corporation, 41-45 Seekonk St, Providence, RI.

•

Kutcher

Van Norman Industries, Inc, New Bedford, Mass, has announced the appointment of *Frank E Kutcher Jr* as controller of H W Butterworth & Sons Co Div, Bethayres, Pa. Mr Kutcher was formerly with the Electronics Division at Manchester, NH, as controller.

Gorman

Richard M Gorman has been appointed sales representative for the Onyx Oil and Chemical Co, Jersey City, NJ.

In his new position, Mr Gorman will cover Ohio, West Virginia, eastern Michigan and northwestern New York, with headquarters in Cleveland.

He was formerly employed by Davison Chemical Co.

•

Anthony M Schwartz has been given the 1960 Committee D-12 Award for outstanding achievement in the field of soap and detergent technology made annually by the American Society for Testing Materials Committee D-12 on Soaps and Other Detergents. The presentation was made March 15 during the Committee's annual meeting at the Park Sheraton Hotel in New York.

Dr Schwartz is manager of the Industrial Chemical Division of Harris Research Laboratories, Washington, DC.

•

Vernon Woodside has been named manager of sales development for heavy chemicals in the Chemicals Division of Olin Mathieson Chemical Corp, and *J L Pickens* has been named manager of field sales for heavy chemicals. Both men will be located in Baltimore.

Mr Woodside was district sales manager in the corporation's New Orleans office. He will be replaced there by *George H Nusloch*, who has been a sales representative in the division's New Orleans, Chicago and Atlanta offices.

Mr Pickens was district manager of the Houston sales office. He is succeeded by *M E Shoemaker*, who was assistant product manager of the acids-sulfur operations, located in Baltimore.

•

Curry E Ford has been named director of marketing for National Carbon Company, Division of Union Carbide Corp. In his new position, Mr Ford will have overall marketing responsibilities for the company's complete line of industrial carbon and graphite products.

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Tyne

Wallace & Tiernan Inc has announced the appointment of *Edmond V Tyne* as sales manager for the Harchem Chemical Department. Mr Tyne replaces *M F Antonovich*, who now heads up Harchem's Purchasing Dept.

Mr Tyne brings 22 years of marketing experience operations to the Harchem Division, whose products include sebacic acid, specialty plasticizers, specialty chemical intermediates, diester fluids for synthetic lubricants plus a broad line of fatty acids and their esters. He was previously Eastern regional sales supervisor for Minnesota Mining & Mfg Co's Chemical Divisions.

●

James McWhirter has been named president and *John O Logan* vice president of Penn-Olin Chemical Co. Mr McWhirter is general manager of the Industrial Chemicals Division, Pennsalt Chemicals Corp, and Mr Logan is a vice president of Olin Mathieson Chemical Corp.

Penn-Olin is a jointly owned subsidiary of Pennsalt and Olin Mathieson, formed to produce sodium chlorate and other chlorate compounds at a plant at Calvert City, Ky, with an annual capacity of 25,000 tons.

Other Penn-Olin officers are *C L Williamson*, secretary, and *W Cooper Willits*, treasurer. Mr Williamson is executive assistant to the associate general manager of Olin Mathieson's Chemicals Division. Mr Willits is treasurer of Pennsalt.

Four directors have been selected from each of the parent companies. Men named from Pennsalt are *James McWhirter, W Cooper Willits, W Alfred LaLande Jr*, and *Albert H Clem*. Directors appointed from Olin Mathieson are *John O Logan, C L Williamson, J G Johns, and J L Wood*.

●

The appointment of *Kenneth T Mecklenborg* to the Basic Research Department of Emery Industries, Inc has been announced. He is engaged in mechanism reaction studies and structure determinations currently being conducted by the department.

Prior to joining Emery, Dr Mecklenborg was associated with the Standard Oil Company of Indiana.

Atkins

Holtzclaw

Crist

Leland G Atkins, cofounder, president and chief executive officer of Southern Dyestuff Co, a Division of American-Marietta Co, has announced a list of promotions and appointments in the executive staff of the Company.

Charles R Holtzclaw has been promoted from general manager to vice president, and all operating departments of the Company will report directly to him. Mr Holtzclaw has been with Southern Dyestuff since 1944.

John L Crist Jr, currently vice president, has been appointed to the newly created position of assistant to the president, in order that he may devote his entire time to those activities of the Company relating to marketing, promotion and trade relations. He joined the Company in 1945.

William G Werth has been promoted from production manager to plant manager, having responsibility now for all plant facilities and production.

John W Jones Jr is now administrative manager.

John L Blake is now director of foreign operations, broadening the scope of his present responsibilities as director of export sales.

●

Herman F Mark, director of the Polymer Research Institute at the Polytechnic Institute of Brooklyn, will speak on "Polymers of the 60's" at Lowell Technological Institute on Tuesday, April 26, at 8:15 pm. His address will be given before the LTI student chapter of the Society of Plastics Engineers, Inc, meeting with the Eastern New England section of the SPE. The lecture will be open to the public.

Morningstar

At its recent meeting, the board of directors of Morningstar-Paisley, New York, NY, elected *Thomas W Morningstar* executive vice president. Mr Morningstar has been serving as vice president and general manager of the M-P Gum and Technical Products Department. Mr Morningstar will continue to serve in this capacity and work closely with *Murray Stempel*, president, to implement the firm's current expansion program.

●

The Commercial Chemical Development Association has presented *Wyly M Billing* with its Honor Award for 1960. This award is made annually for notable achievement in the field of commercial chemical development. It was presented on March 17th at the dinner and meeting of the Association at the Plaza Hotel in New York.

Dr Billing is a vice president and member of the executive committee of Hercules Powder Co.

It was announced at the Annual Business Meeting that new officers of the Association have been elected.

James G Affleck was chosen president-elect. He is manager of Rubber Chemicals Department, Organic Chemicals Division, American Cyanamid Co.

Winthrop M Barnes, assistant director, Research & Development Division, Sun Oil Co, was elected to the office of executive secretary.

Alfred G Rossow, manager, market research & development, Petroleum Chemicals Dept, Mobil Oil Co, was elected treasurer.

Robert I Stirton, manager, Product Development Dept, Oronite Chemical Co, and *Harry F Pfann*, director, commercial development, Pittsburgh Coke & Chemical Co, were elected directors.

G B Carpenter, chemical consultant, and *Carl Pacifico*, vice president, American Alcolac Corp, as directors will complete the second year of their two-year term.

These newly elected officers, along with *James R Dudley*, current president-elect and vice president of the Richardson Co, will take office on July 1.

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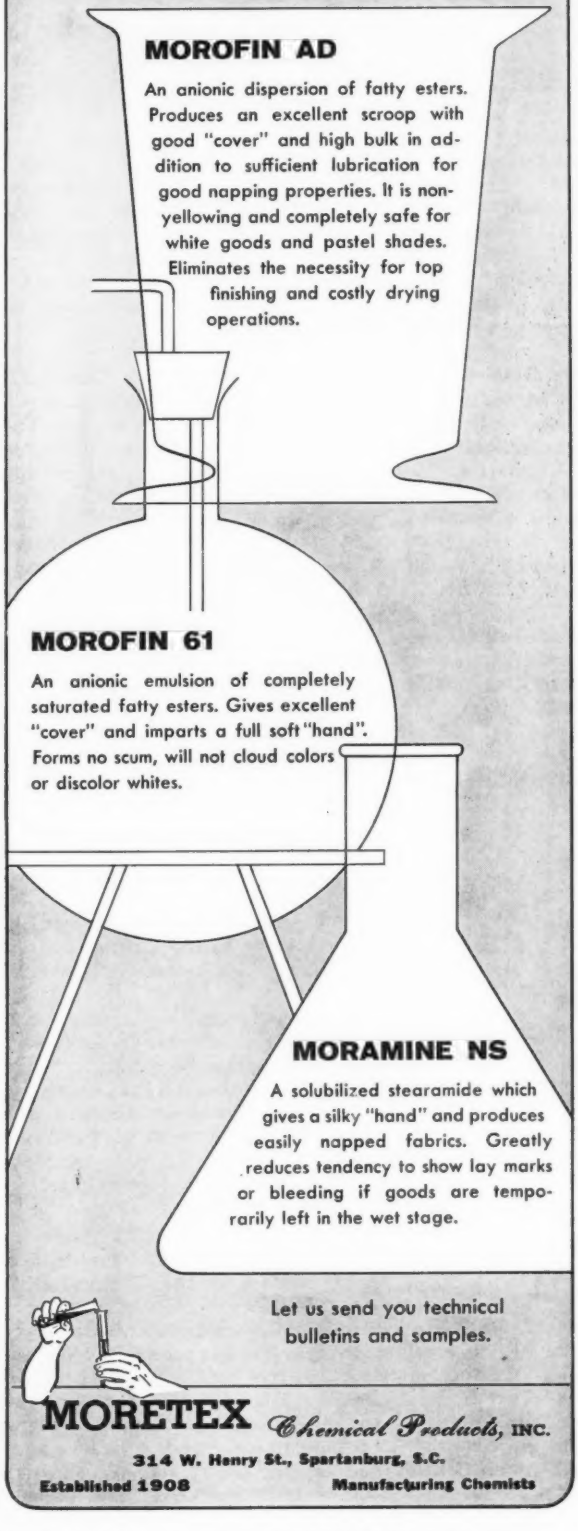

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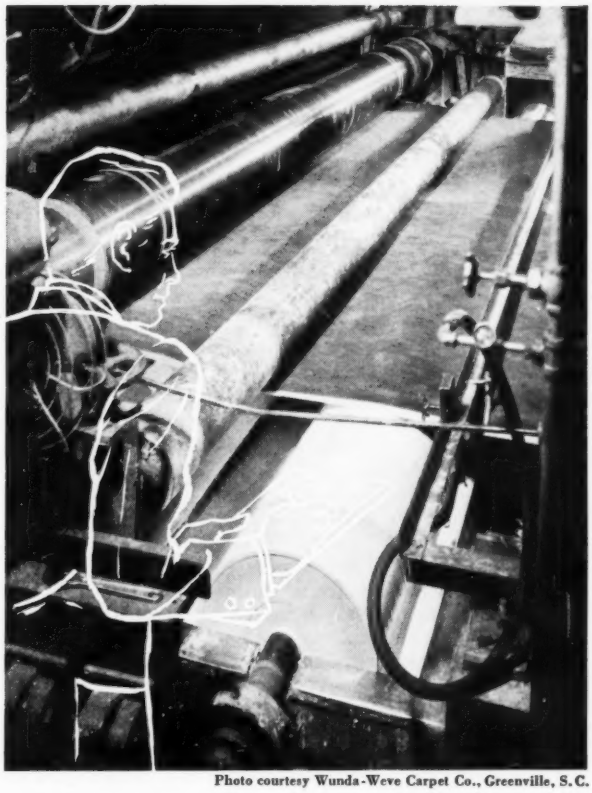

Photo courtesy Wunda-Weve Carpet Co., Greenville, S.C.

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Hogan

Century Chemical Corp has announced the appointment of *John F Hogan Jr* as director, commercial chemical development, and *Walter G Frohlich* as managing director of European operations for the International Division.

Before assuming his new duties, Hogan was engaged in development work for Chemo Puro AG, a wholly owned subsidiary of Century Chemical. Prior to that he was associated with Refined Products Corp, Lyndhurst, NJ, where he was engaged in product development and market research work on sequestering agents.

Dr Frohlich had been associated with Chemo Puro AG. Under Century's plan for expanded foreign operations, the International Division was formed, integrating into it the functions of Chemo Puro AG. The new scope of Dr Frohlich's activities will include the coordination, direction and supervision of foreign sales, licensing, acquisitions and manufacturing in the United Kingdom, Scandinavia, Continental Europe, North Africa and the Middle East.

•

Names of committee chairmen for the 57th Annual Convention of Phi Psi, national textile fraternity, have been jointly announced by *Benjamin S Bellemere*, Bellemere Chemicals Co, Reading, Pa, grand president of Phi Psi, and *Douglas E Ix*, Frank Ix & Sons, Inc, New York, president of the host New York Alumni Chapter.

General chairman of the event, to be held April 28, 29, and 30 at the Hotel Roosevelt in New York, is *Roger A Lewis* of Deering Milliken & Co. Other committee chairmen are as follows: Fraternity Activities———*George F Long*, Harchem Division, Wallace & Tiernan, Inc; Attendance———*William Brosnan*, Deering Milliken & Co; Activities———*Earl J Goven*, American Thread Co; Honorary Members———*P J Wood*, Royce Chemical Co; Employment Seminar———*Douglas F Grady*, Pepperell Mfg Co; Entertainment———*Robert Kirchner*, J P Stevens & Co, Inc; Banquet———*George Stanley*, Courtaulds, Inc; and Publicity———*James H Kennedy*, James H Kennedy & Co.

Franklin

Air Reduction Chemical Company, a division of Air Reduction Company, Inc has opened a new sales office in Charlotte, NC, with *Lloyd E Franklin Jr* as sales and development representative. The office is in a new building recently constructed by Air Reduction Sales Company at 2300 South Blvd and is supported by new warehouse facilities.

Franklin will handle Airco Chemical sales and service in the southeastern states of North Carolina, South Carolina, Georgia, Alabama, Florida and eastern Tennessee. He will call on accounts in the textile and chemical processing industries.

With Airco since March 1959, Franklin was assigned initially to the technical sales laboratory at Bound Brook, NJ.

Headquarters for Air Reduction Chemical and the parent organization, Air Reduction Company, Inc are at 159 East 42nd Street, New York 17, NY. Air Reduction Chemical manufactures vinyl monomers, polyvinyl alcohol, surface-active agents, and acetylenic chemicals.

•

J Stewart Campbell has been appointed special projects manager for the research and development activities related to Darvan, the nytril fiber recently acquired by Celanese Corporation of America from B F Goodrich Co.

Campbell will be responsible for coordinating the Darvan pilot plant work at the Goodrich Development Center at Avon Lake, Ohio with research and development programs being conducted by various Celanese departments.

Mr Campbell was previously manager of laboratory facilities at the Celanese Central Research Laboratories at Summit, NJ.

•

J J Hermans, director of the Cellulose Research Institute at the New York State University College of Forestry, addressed a Textile Research Institute seminar on March 17. Dr Hermans' seminar was entitled "Elastic Properties of Swollen Cellulose Gels."

McCarthy

Donald O McCarthy has been named assistant production manager for Petrothene polyethylene resins by U S Industrial Chemicals Co, Division of National Distillers and Chemical Corp.

At the time he was appointed to his new position, Mr McCarthy was an area superintendent.

•

New assignments for *James B Mumma, John A Hardy, Clair S Mitch, John R West, D Wallace Enright, James R Leusch*, and *Coleman C Yeaw* have been announced by Union Carbide Chemicals Co, Division of Union Carbide Corp.

Mr Mumma is now office manager in the Boston district. He was formerly a technical representative assigned to the Newark district.

Mr Hardy, previously a supervisor in the general sales office, has been assigned as an assistant to the product management group.

Mr Mitch, formerly a technical representative in the Chicago district, is now a supervisor in the general sales office.

Mr West has been transferred to the Newark district. He was previously a technical representative in the Cincinnati district.

Mr Enright, previously a technical representative in the Chicago district office, has been transferred to field sales.

Mr Leusch, formerly assigned as a technical representative in the Boston district office, has been transferred to field sales in the Houston district.

Mr Yeaw, previously assigned as a technical representative in the Newark district office, has been transferred to Cincinnati district field sales.

•

Appointment of *Robert L Peiffer* to be sales supervisor for textile and leather trades for the Chemical Division of Minnesota Mining and Manufacturing Co has been announced.

Peiffer, who has been with 3M since 1956 and has been a salesman in the textile and leather trades, will be responsible for an area including New England, the Central Atlantic states and eastern Ohio. His headquarters will be at 99 Park Ave, New York.

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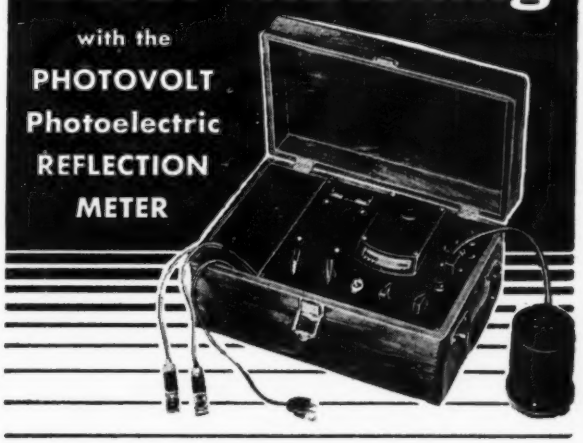

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PHOTOVOLT CORP.
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R Lee Wayland Jr has been named an assistant director of research at Dan River Mills, Inc. In his new post, Dr Wayland will continue to direct the basic and applied research on special finishes for cotton and blended fabrics.

C L Zimmerman, assistant director of research, has been assigned broader responsibilities and is now in charge of the research and development program on chemicals for water treatment and sizing. Mr Zimmerman continues to direct research activities related to the company's dyeing operations.

Both men are active in AATCC. Mr Zimmerman is a National Councilor, and Dr Wayland heads up a research committee for the Piedmont Section investigation chlorine retention in fabrics.

•

Quittman M Rhodes has been appointed sales manager, and *Clyde N Whitesides* has been appointed southern district manager for the textile chemicals department, American Cyanamid Co.

Mr Rhodes has served as southern district manager for the textile chemicals department since 1958.

Mr Whitesides has been a salesman for the company's textile chemicals department in Charlotte, NC, since 1950.

•

Durward W Adams has joined the sales staff of DePaul Chemical Co, Inc, Long Island City, NY. He will serve as a sales and technical manager in the South with temporary headquarters in Rocky Mount, NC.

Before joining DePaul, Mr Adams was associated with Sidney Bluementhal Co, Rocky Mount, NC, for 23 years, 19 years as plant superintendent.

Lester E Francis (center), director of advertising, Emery Industries, Inc, Cincinnati, and James M Chisholm (right), general manager, Sanitone drycleaing division of Emery Industries, are shown above accepting the winning "Prestige Builders Award" being presented by Frank A Prather, past president of the National Institute of Drycleaning at the recent annual convention of NID in Chicago.

OBITUARY

STEPHEN I RUDO

STEPHEN I RUDO, 63, died last month after an illness of four weeks. He was director of research and development of Werner Textile Consultants, New York, NY.

His career in textiles started in a weaving and dyeing plant in his native Hungary and he was a partner for 20 years in the Grab Textile Works, Ltd, Gyoer, Hungary, which produced cotton and rayon fabrics. Before joining Werner Textile Consultants in 1949, he was a director of the International Braid Corp, Fall River, Mass, manufacturers of narrow fabrics. He was also the inventor of a patented circular loom for weaving specialty fabrics.

Mr Rudo was widely known in textile circles through frequent articles on industry problems in major trade papers and through lectures on technical and economic subjects to industrial, educational and trade groups.

He belonged to several trade associations: AATCC, AATT, ASME, ASQC, ASTM, Textile Quality Control Association, and Textile Institute (Manchester, England).

•

WALTER J SULLIVAN

WALTER J SULLIVAN, 62, a technical salesman for the Dyestuffs Division, E I duPont de Nemours & Co, Inc, died recently in Mount Auburn Hospital. A graduate of Lowell Technological Institute and mambre of the Northern New England Section, AATCC, Mr Sullivan had been with DuPont about 40 years.

•

JOSEPH W RUSSELL

JOSEPH W RUSSELL, a charter member of AATCC and chief chemist at the Nashua Manufacturing Co, Nashua, NH, until the sale of the company, died recently after a long illness.

General Calendar

AMERICAN ASSOCIATION FOR TEXTILE TECHNOLOGY
May 4, June 1 (Della Robbia Room, Hotel Vanderbilt, New York, NY)

AMERICAN COTTON MANUFACTURERS INSTITUTE
Mar 23-25 (12th Annual Meeting, Fontainebleau Hotel, Miami Beach, Fla)

AMERICAN SOCIETY FOR TESTING MATERIALS
June 26-July 1 (Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, NJ)

AMERICAN TEXTILE MACHINERY ASSOCIATION
May 23-27, 1960 (American Textile Machinery Exhibition, Auditorium, Atlantic City, NJ)

CHEMICAL EXPOSITION USA
Sept 13-15 (Statler Hilton Hotel, New York, NY)

FEDERATION OF BRITISH INDUSTRIES
June 10-26 (British Exhibition of Industry, Technology, Science and Culture—Coliseum, New York, NY)

INTERNATIONAL TEXTILE MACHINERY EXPOSITION
1962 (3rd Exposition, Hanover, Germany)

NATIONAL ACADEMY OF SCIENCES
May 17-18 (Conference on Blend Fabrics, Quartermaster Research & Engineering Command, Natick, Mass)

NATIONAL COTTON COUNCIL
Sept 28-30 (9th Chemical Finishing Conference, Statler Hotel, Washington, DC)

PHI PSI FRATERNITY
April 28-30 (57th Annual Convention, Hotel Roosevelt, New York, NY)

PHILADELPHIA TEXTILE INSTITUTE
April 23 (75th Anniversary Convocation—Dedication Exercises, Philadelphia, Pa)

PURDUE UNIVERSITY
May 3-5 (15th Industrial Waste Conference, Purdue Memorial Union Bldg, Lafayette, Ind)

SOUTHERN TEXTILE EXPOSITION
Oct 3-7 (Greenville, SC)

SYNTHETIC ORGANIC CHEMICAL MANUFACTURERS ASSOCIATION
May 11-13 (Spring Outing, Shawnee Inn, Shawnee-on-Delaware, Pa); June 14, Sept 13, Oct 11, Dec 8 (Hotel Roosevelt, New York, NY)

TEXTILE OPERATING EXECUTIVES OF GEORGIA
April 23, Oct 22 (Harrison Hightower Bldg, Georgia Inst of Technology, Atlanta, Ga)

WOOL TEXTILE RESEARCH CONFERENCE
May 18-28 (Harrogate, England)

WORLD CONGRESS FOR MAN-MADE FIBERS
May 15-18, 1962 (2nd World Congress, London, England)